Intended for
Vantage Data Centers Ltd

Document type
Report

Date
November 2023

NORTH ACTON ROAD – LHR21
AIR QUALITY ASSESSMENT

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AIR QUALITY ASSESSMENT

Project name	**LHR21 Environmental Permitting**
Project no.	**1620013218-007**
Recipient	**Vantage Data Centers Ltd.**
Document type	**Report**
Version	**02**
Date	**29/11/2023**
Prepared by	**C.Hayles**
Checked by	**G.Harker**
Approved by	**R.Wood**
Description	**2nd Draft**

Revision	**Date**	**Prepared by**	**Checked by**	**Approved by**	**Description**
01	10/10/2023	CH	GH	RW	First draft for review
02	29/11/2023	CH	GH	RW	Second draft for review

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EXECUTIVE SUMMARY

This air quality assessment has been prepared by Ramboll UK Ltd. ('Ramboll') on behalf of Vantage Data Centers Ltd in support of an Environmental Permit application for the LHR21 data centre at 37-39 North Acton Road, Park Royal, NW10 6SN ('the Site').

An assessment of the impacts of emissions from the emergency generators has been undertaken assuming that the site suffers a loss of power and all of the emergency generators are operational. The emergency generators will be fitted with SCR abatement and therefore can operate up to 276 hours per year with a 1% probability of exceeding the short term NO_2 objective. Predicted annual mean NO_2 impacts have been factored to 72 hours operation which is considered a realistic maximum operating hours in an emergency and impacts are not significant. Impacts at ecological sites during the emergency scenario are potentially significant for daily mean NO_x concentrations although there is a low probability of the impacts actually arising in the first place.

An assessment of impacts during testing has been undertake assuming that 1 generator will be operating and therefore the emission rate will be 14 times smaller than for the emergency scenario. Annual impacts have been factored by the maximum testing hours of 336 hours per year. Predicted annual mean NO_2 impacts at relevant receptor locations are not significant for these operating hours. Impacts at ecological sites are not significant.

1. INTRODUCTION

1.1 Development

This air quality assessment has been prepared by Ramboll UK Ltd. ('Ramboll') on behalf of Vantage Data Centers Ltd in support of an Environmental Permit application for the LHR21 data centre at 37-39 North Acton Road, Park Royal, NW10 6SN ('the Site'). The data centre has backup power systems comprising of fourteen diesel generators.

When in use in an emergency all of the generators could be operational and therefore the impacts during an emergency are higher than those when individual or groups of generators are being routinely tested. The impacts during an emergency have been assessed as well as the impacts during routine testing.

This report sets out the method and results of the dispersion modelling used to assess the impact of the diesel generator array on local air quality.

1.2 Operation

The generators will be used to provide back-up power in the event of a loss of power to the data centre, i.e. an emergency scenario. For the purposes of the modelling it is assumed that all of the generators would operate simultaneously at maximum load in an emergency. The likelihood of this occurring is very low given the grid reliability and redundancy in power supplies to the data centre; in addition, it is not predictable when an emergency scenario would occur.

Regular testing of the generators at the site is also required to ensure that the generators are operational and capable of providing back-up power. Each of the generators at the site will be subject to a regular testing regime; the testing regime is expected to be in place prior to commencement of operations. The testing regime is likely to involve periods of operation at different loads on a monthly basis, but as worst-case basis full load operation can be assumed.

Based on available information, it is anticipated that each generator will be run for up to 24 hours per year for periodic testing. This testing regime is below the individual generator testing target set out by the EA within the Data Centre FAQ Headline Approach Guidance of 50 hours/annum per generator. Total testing hours for all 14 generators is 336 hours per year. For the purposes of assessing impacts during testing, the emissions from one generator have been considered.

1.3 Emissions

The assessment of the impact of emissions from the diesel generators has been based on data sheet values (Appendix B). The proposed engines are Kohler KD3500E derated to 3250 kVA. 8 generators will be installed initially in Phase 1 in 2024 followed by a further 6 generators in Phase 2 in 2025. The engines will be fitted with SCR to reduce NO_x emissions; it is proposed that the SCR abatement is set to reduce NO_x emissions by approximately 90% which means that the engine emissions will meet MCPD emission limits for NO_x. The SO_2 emission rate is based on the fuel flow of the engine assuming a maximum sulphur content in the HVO fuel of 5mg/kg (0.0005%) as advised by the supplier. The ammonia emission rate (due to slip from the use of SCR) is assumed to be equivalent to the BAT upper emission concentration of 15 mg/Nm^3 on a conservative basis.

The calculated emission concentration data is shown in Table 1-1 for each engine.

Table 1-1: Engine Emission Rates 100% ESP

Pollutant	g/s	mg/Nm³ ($5\% O_2$)	mg/Nm³ ($15\% O_2$)
NO_x	0.78	323	120
CO	0.17	68.3	25
PM	0.01	3.41	1.3
SO_2	0.0017	0.68	0.25
NH_3	0.10	40.4	15

The normalised volumetric flowrates (dry gas, 273K) at 5% and 15% oxygen are 2.447 and 6.528 Nm^3/s respectively. These have been back calculated from the emissions data sheet in Appendix B, i.e. g/kWh x kW to give g/s and then the Nm^3/s calculated from the normalised emission concentration data presented. The oxygen and water vapour content are not required to perform the normalisation calculation or for the modelling. There is no breakdown of the particulate matter size range available and therefore all PM is assumed to be either PM_{10} or $PM_{2.5}$ which is a conservative approach.

1.4 Environmental Assessment Levels

The relevant Environmental Assessment Levels (EALs) for human health and ecological receptors are detailed in Table 1-2 below. Nitrogen and acid deposition at ecological receptors are dealt with in Section 3.

Table 1-2: EALs

Pollutant	Concentration (µg/m³)	Averaging Period	Exceedances Allowed per annum	Percentiles
Human Health Receptors				
NO_2	200	One hour mean	18	99.79
	40	Annual mean	-	-
CO	30,000	One hour mean	-	-
	10,000	8 hour running mean	-	-
PM_{10}	50	Daily mean	35	90.41
	40	Annual mean	-	-
$PM_{2.5}$	20	Annual mean	-	-
SO_2	266	15 minute mean	35	99.9
	350	One hour mean	24	99.73
	125	Daily mean	3	99.18
Ecological Receptors				
NO_x	75*	Daily mean	-	-
	30	Annual mean	-	-
SO_2	10	Annual mean	-	-

Pollutant	Concentration (µg/m³)	Averaging Period	Exceedances Allowed per annum	Percentiles
NH_3	1**	Annual mean	-	-
Ozone***	A0T40 of 6,000	Between May and July	-	-

* where ozone AOT40 above critical level,
** assumes lichens and bryophytes present,
*** only to assess which daily mean NO_x critical level applies.

1.5 Screening for Modelling

1.5.1 Dispersion Factors

Pollutant emissions have been screened using the Environment Agency PC dispersion factor[1] to ascertain those pollutants that require detailed dispersion modelling. The flue heights are 5.8m above the maximum building height of 39.7m meaning the effective stack height is 9.6m. The PC dispersion factors for annual mean and hourly mean concentrations are therefore 36.64 and 713 µg/m²/(g/s) respectively.

The hourly mean concentrations have been factored to the short-term averaging periods in accordance with EA guidance as follows:

- 8 hour averaging period using a conversion factor of 0.7;
- 15-minute averaging period using a conversion factor of 1.34;
- 24 hour averaging period using a conversion factor of 0.59.

The resulting concentrations are compared against the Environmental Assessment Levels (EALs) for the pollutant to ascertain whether modelling is required.

1.5.2 Emergency Operation

For annual mean impacts the annual operating hours in an emergency have been assumed to be a 72 as a realistic maximum. During the emergency scenario the impacts of CO, SO_2 and annual mean impacts of PM_{10}, $PM_{2.5}$ and NO_x and NH_3 for locally designated sites screen out of dispersion modelling. The predicted concentrations based on the emissions from 14 generators are provided in Table 1-3.

Table 1-1-3: Emergency Operation Screening Maximum Ground Level Concentrations (µg/m³)

Pollutant	g/s	PC (µg/m³)	EAL (µg/m³)	PC % EAL
NO_x – Annual (locally designated sites)	10.9	3.3	30	11.0
NH_3 – Annual (locally designated sites)	1.4	0.4	1	40
CO – 1 hour	2.38	1,668	30,000	5.56

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Pollutant	g/s	PC ($\mu g/m^3$)	EAL ($\mu g/m^3$)	PC % EAL
CO – 8 hour		1,167	10,000	11.7
SO_2 – 15 minutes	0.0238	22.3	266	8.4
SO_2 - 1 hour		16.7	350	4.8
SO_2 – Daily		9.8	125	7.9
SO_2 - Annual		0.86	10	8.6

The PC of the 8-hour average CO is just above the screening criteria and therefore consideration needs to be given to the PEC. For detailed modelling to be required, the short-term PC must be greater than 20% of the short term EAL minus twice the long-term background concentration.

The long-term background CO concentration is not available from the latest background maps, the last map update of CO concentrations was in 2001. Data for the grid square encompassing the site indicates that the annual mean CO concentration was 501 $\mu g/m^3$. The PEC screening threshold is therefore:

- 0.2 x (10,000 – 1,002) = 1,800 $\mu g/m^3$.

As the short-term PC is 1,167 $\mu g/m^3$ and therefore less than the screening threshold then detailed modelling of CO can be screened out.

The annual mean SO_2 concentration is only relevant for impacts on ecological receptors and screens out for impacts on local nature sites as less than 100% of the critical level. For Richmond Park SPA (and SSSI) and Wimbledon Common SPA (and SSSI) (see Section 4.2.3), the impacts are above 1% and therefore consideration of the PECs is required. As with CO, the latest background maps do not contain predictions of SO_2 concentrations, the latest data is from 2001 and therefore will be conservative considering the reductions in SO_2 emissions that have occurred since 2001.

The maximum predicted annual mean SO_2 concentration for Richmond Park SPA and Wimbledon Common SPA in 2021 was 3.97$\mu g/m^3$. The maximum PEC is therefore 4.8$\mu g/m^3$ or 48% of the critical level and therefore detailed modelling of annual mean SO_2 concentrations for ecological impacts is not required.

Nitrogen deposition- locally designated sites

The Air Pollution Information System (APIS)[2] provides critical loads for nitrogen deposition (leading to eutrophication) and nitrogen acid deposition (leading to acidification) for different habitat types and specific site relevant critical loads for SACs, SPAs and SSSIs.

For locally designated sites where such information is not readily available, then the lowest critical load published on APIS can be used as a screening criteria. For grassland habitats, the lowest critical load is 5kgN/ha/yr and for woodland habitats it is 10kgN/ha/yr.

For calculated nitrogen deposition for the locally designated sites is shown in Table 1-4 below based on the predicted NO_x and NH_3 concentrations in Table 1-3.

[2] http://www.apis.ac.uk accessed August 2020

Table 1-4: Predicted nitrogen deposition at locally designated sites

Receptor	Habitat Type	Nitrogen deposition (kgN/ha/yr)			% Critical Load
		Oxidised	Reduced	Total	
Locally designated sites	Grassland	0.48	2.15	2.62	52
	Woodland	0.95	3.22	4.17	42

Table 1-4 shows that the nitrogen deposition screens out of modelling for locally designated sites.

1.5.3 Generator Testing

For the assessment of impacts during testing it is assumed that 1 generator will be operating and therefore the emission rate will be 14 times smaller than for the emergency scenario. Annual impacts have been factored by the maximum testing hours of 336 hours per year.

Impacts of CO, SO_2, particulate matter (PM_{10} and $PM_{2.5}$) and annual mean NO_x and NH_3 for locally designated sites will screen out from modelling as shown in Table 1-5.

Table 1-5: Testing Screening Maximum Ground Level Concentrations (µg/m^3)

Pollutant	g/s	PC (µg/m^3)	EAL (µg/m^3)	PC % EAL
NO_x – Annual (locally designated sites)	0.87	1.1	30	3.7
NH_3 – Annual (locally designated sites)	0.10	0.14	1	13.8
CO – 1 hour	0.17	119.1	30,000	0.4
CO – 8 hour		83.4	10,000	0.8
SO_2 – 15 minutes	0.0017	1.6	266	0.6
SO_2 - 1 hour		1.2	350	0.3
SO_2 – Daily		0.7	125	0.6
SO_2 - Annual		0.01	10	0.1
PM_{10} – annual	0.01	0.01	40	0.03
PM_{10} – daily		3.5	50	7.0
$PM_{2.5}$ – annual		0.01	20	0.06

<u>Nitrogen deposition- locally designated sites</u>

For calculated nitrogen deposition for the locally designated sites is shown in Table 1-6 below based on the predicted NO_x and NH_3 concentrations in Table 1-5.

Table 1-6: Predicted nitrogen deposition at locally designated sites

Receptor	Habitat Type	Nitrogen deposition (kgN/ha/yr)			% Critical Load
		Oxidised	Reduced	Total	
Locally designated sites	Grassland	0.16	0.72	0.87	17
	Woodland	0.32	1.07	1.39	14

Table 1-6 For calculated nitrogen deposition for the locally designated sites is shown in Table 1-4 below based on the predicted NO_x and NH_3 concentrations in Table 1-3.

Table 1-4shows that the nitrogen deposition screens out of modelling for locally designated sites.

2. SITE DESCRIPTION

2.1 Site Location

The Site is located at 37-39 North Acton Road, with a total site area of 0.49 hectares (ha). The Site, which currently comprises three commercial/industrial buildings (two-storey) and associated parking, is bounded to the north, east and west by industrial and commercial buildings. A recreation ground and residential properties are located to the south and southwest (Figure 2-1).

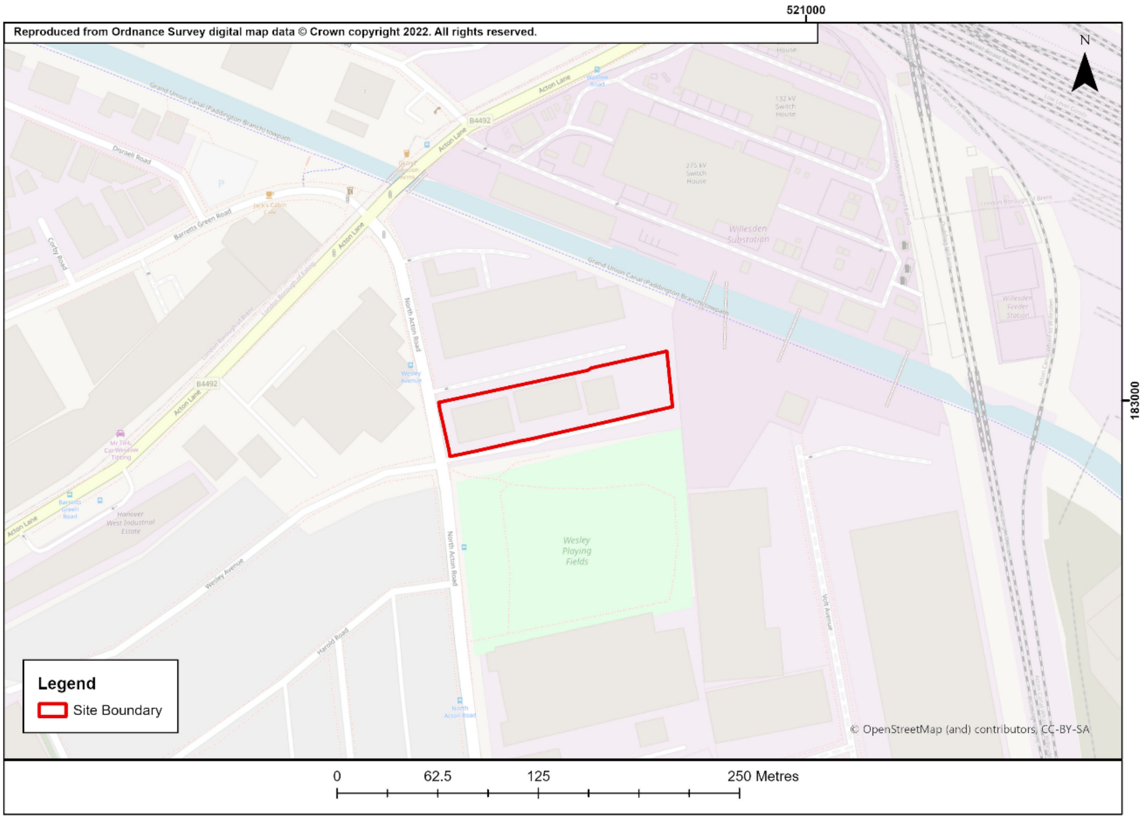


Figure 2-1: Site Location

2.2 Site Air Quality Designations

The whole of the London Borough of Ealing (LBE) has been declared an Air Quality Management Area (AQMA) for exceedances of the annual mean NO_2 and daily mean PM_{10} national air quality objectives (AQOs). The same applies to the north of the Site, where the whole of the London Borough of Brent has similarly been declared an AQMA.

The Site is located within the Old Oak and Park Royal Opportunity Area. All Non-Road Mobile Machinery (NRMM) within an Opportunity Areas used during demolition and construction phase will need to comply with stage IV emissions standards[3].

London's Ultra Low Emission Zone (ULEZ) was expanded on 26th October 2021 to create a single larger zone bound by the North and South Circular Roads, which now includes the whole of the Site[4].

[3] https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/nrmm
[4] https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/ulez-where-and-when

In accordance with Environment Agency guidance, a screening distance of 2 km has been used for Local Designated Sites and Sites of Special Scientific Interest (SSSI), and 10km for Special Protection Areas (SPAs) and Special Areas of Conservation (SAC).

Wormwood Scrubs Local Nature Reserve lies approximately 1.3 km to the southeast of the Site; Richmond Park SAC and SSSI lies approximately 8.4 km to the south and Wimbledon Common SAC and SSSI approximately 9.8 km to the southeast. Whilst the emergency generator will not operate for extended periods of time, the impacts of emergency operations on these designated sites has been assessed.

3. ASSESSMENT CRITERIA

3.1 Air Emissions Risk Assessment

Guidance on air emissions risk assessments[5] was produced by the Environment Agency (EA) for developments which require a bespoke environmental permit under the *Environmental Permitting Regulations 2016 (as amended) (EPR)*. This guidance can be used to support an assessment of the overall impact of the emissions resulting from the installation to confirm that the emissions are acceptable (i.e. do not cause significant environmental pollution). In addition, the assessment has taken account of EA guidance on specified generators: *EA Emissions from specified generators* guidance[6] and *Data Centre FAQ Headline Approach*[7] guidance issued by the EA to assist with permit applications for data centres.

During the permit determination for the recent CyrusOne Stirling Road permit application (EA/EPR/EP3608PM/A001) the EA specifically requested information to be provided on the 100th percentile of one hour mean NO_2 concentrations for consideration against Daily Air Quality Index (DAQI) and Acute Exposure Guideline Levels (AEGLs). However, to date, no guidance has been provided by the EA on the acceptability criteria for these impacts.

3.2 Assessment Criteria

3.2.1 Human Health Receptors

The long term and short-term environmental assessment levels (EALs) that are applicable to this assessment are detailed below in Table 1-2 in relation to human health.

3.2.2 Short Term NO_2 Concentrations

As the generators are only tested for a total of 24 hours per year each, the standard modelling approach of running the generators all year round and using the highest predicted concentrations is very conservative. This is because it is unlikely that the generators will be operating when worst case dispersion conditions occur. Hence, the EA guidance requiring a statistical approach for assessing the likelihood of exceeding the short term NO_2 objective is considered the most appropriate approach to adopt for assessing the environmental risk.

In terms of the testing, the monthly tests only involve each generator running individually for 24 hours, a maximum testing hours of 336 hours per year.

The model has been set up to run one generator operating all year, the annual mean results have been factored by the maximum testing hours of 336 hours per year. The 100th percentile of hourly mean NO_2 concentrations for each scenario have been considered as follows.

3.2.3 Daily Air Quality Index

The DAQI provides information to the public on levels of air pollution and provides recommended actions and health advice according to the levels. The index is numbered 1-10 and divided into four bands, low (1) to very high (10), to provide detail about air pollution levels in a simple way.

[5] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit sourced February 2021
[6] https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf sourced November 2018
[7] Data Centre FAQ Headline Approach, DRAFT version 10.0 H.Tee 01/06/18 – Release to Industry

The band descriptions and hourly mean NO_2 concentrations corresponding to each level are shown in the following tables.

Recommended Actions and Health Advice

Air Pollution Banding	Value	Accompanying health messages for at-risk individuals*	Accompanying health messages for the general population
Low	1-3	**Enjoy** your usual outdoor activities.	**Enjoy** your usual outdoor activities.
Moderate	4-6	Adults and children with lung problems, and adults with heart problems, **who experience symptoms**, should **consider reducing** strenuous physical activity, particularly outdoors.	**Enjoy** your usual outdoor activities.
High	7-9	Adults and children with lung problems, and adults with heart problems, should **reduce** strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also **reduce** physical exertion.	Anyone experiencing discomfort such as sore eyes, cough or sore throat should **consider reducing** activity, particularly outdoors.
Very High	10	Adults and children with lung problems, adults with heart problems, and older people, should **avoid** strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	**Reduce** physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

Ozone | Nitrogen Dioxide | Sulphur Dioxide | PM2.5 Particles | PM10 Particles

Nitrogen Dioxide

Based on the hourly mean concentration.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	601 or more

3.2.4 Acute Exposure Guideline Levels

AEGLs describe the human health effects from once-in-a-lifetime, or rare, exposure to airborne chemicals. Used by emergency responders when dealing with chemical spills or other catastrophic exposures, AEGLs are set through a collaborative effort of the public and private sectors worldwide. AEGLs are calculated for five relatively short exposure periods – 10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours – as differentiated from air standards based on longer or repeated exposures. AEGL "levels" are dictated by the severity of the toxic effects caused by the exposure, with Level 1 being the least and Level 3 being the most severe.

All levels are above which it is predicted that the general population could experience, including susceptible individuals:

Level 1

- Notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

Level 2

- Irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

Level 3

- Life-threatening health effects or death.

Below AEGL Level 1

Airborne concentrations below the AEGL-1 represent exposure levels that could produce mild and progressively increasing but transient and non-disabling odour, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL.

AEGL values represent threshold levels for the general public, including susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses. However, it is recognized that individuals, subject to unique or idiosyncratic responses, could experience the effects described at concentrations below the corresponding AEGL. The nitrogen dioxide AEGLs are shown below.

Nitrogen dioxide Result - AEGL Program

Nitrogen dioxide 10102-44-0 (Final)

	10 min	30 min	60 min	4 hr	8 hr
ppm					
AEGL 1	0.50	0.50	0.50	0.50	0.50
AEGL 2	20	15	12	8.2	6.7
AEGL 3	34	25	20	14	11

As the levels are provided in ppm, they have been converted to µg/m³ assuming 1ppm = 1,912.5 µg/m³. AEGL-1 is the most stringent, and has the same value of 956 µg/m³ for all averaging periods between 10 minutes and 8 hours.

3.2.5 Nature Conservation Receptors

NO_x concentrations

In addition to the NAQO for human health, there is a critical level for the protection of vegetation and ecosystems of 30µg/m³ as an annual average. In addition, in terms of the assessment of the impacts of NO_x emissions for an Environmental Permit, the assessment is required to consider the daily mean concentration against a critical level of 75µg/m³ where ozone is above the AOT40 critical level and SO_2 concentrations are above the lower critical load of 10 µg/m³.

Background Automatic Air Quality Monitoring Stations (AAQMS) and background data maps accessed from the Department for Environment, Food and Rural Affairs (Defra) data archive were reviewed to determine whether any exceedances of the O_3 or SO_2 Critical Levels may be exceeded within the study area.

Two background AAQMS closest to the project boundary were identified using the Defra interactive monitoring network map[8], these sites are London North Kensington and London Haringey Priory Park South. Hourly O_3 and SO_2 monitoring data from 2018 – 2022 were downloaded for Kensington; SO_2 is not monitored at London Haringey Priory Park South so only O_3 data were obtained. The O_3 background monitoring results for London North Kensington and London Haringey Priory Park South are shown in Table 3-1 and Table 3-2 respectively. The SO_2 background monitoring results for London North Kensington are shown in Table 3-3.

Table 3-1: Ozone AOT40 monitoring results for London North Kensington

Year	Vegetation Protection Ozone AOT40
2018	10,648
2019	4,711
2020	7,424
2021	4,538
2022	7,391
Five-year Average	**6,942**
Critical Level	Target value of 6,000 µg/m³ averaged over five years

Table 3-2: Ozone AOT40 monitoring results for London Haringey Priory Park South

Year	Vegetation Protection Ozone AOT40
2018	9,961
2019	3,685

[8] DEFRAs, Interactive Monitoring networks Map, https://uk-air.defra.gov.uk/interactive-map, [Accessed 04/10/2023]

2020	7,726
2021	2,338
2022	8,017
Five-year Average	**6,345**
Critical Level	Target value of 6,000 µg/m^3 averaged over five years

Table 3-3: Annual mean SO_2 monitored concentrations for London Kensington

Year	**Annual Sulphur Dioxide Concentrations (µg/m^3)**
2018	1.4
2019	1.6
2020	2.3
2021	2.3
2022	0.8
Five-year Average	**1.7**
Critical Level	10

The results presented in tables Table 3-1 and Table 3-2 show that the concentrations of ozone are above the Critical Level of 6,000 µg/m^3 for vegetation protection, with the highest concentrations recorded in 2018 at both monitoring sites. As such, the daily mean NO_x concentration has been evaluated against the critical level of 75µg/m^3.

Nitrogen deposition

The Air Pollution Information System (APIS)[9] provides critical loads for nitrogen deposition (leading to eutrophication) and nitrogen acid deposition (leading to acidification) for different habitat types and specific site relevant critical loads for SACs, SPAs and SSSIs.

For both Richmond Park and Wimbledon Common APIS provides critical loads for woodland and grassland type habitats. The lowest critical loads for each habitat type are 10-20kgN/ha/yr and 5-10kgN/ha/yr respectively.

For non-designated sites such as Wormwood Scrubs, where such information is not readily available, then the lowest critical load published on APIS can be used as a screening criteria. For grassland habitats, the lowest critical load is 5kgN/ha/yr.

[9] http://www.apis.ac.uk [accessed September 2023]

4. METHODOLOGY

4.1 Baseline

In order to establish baseline air quality in the vicinity of the Site, relevant monitoring data was reviewed and assessed. Data was obtained from the following sources:

- diffusion tubes operated by the London Borough of Ealing (LBE) and associated Annual Progress Report[10]; and
- Department of Environment, Food and Rural Affairs (Defra) background maps[11].

No additional site-specific air quality monitoring was carried out.

4.2 Emergency Generator Impacts

4.2.1 Model Set Up

4.2.1.1 Emission Rates and Operating Hours for Emergency Operation

Air quality impacts were modelled using the Atmospheric Dispersion Modelling System (ADMS 6)[12] air quality dispersion model, originally developed for regulatory authorities in the UK. The model uses representative meteorological data for the local area and plant emissions data to predict ambient concentrations of pollutants in the vicinity of the Site.

For dispersion modelling purposes it is assumed that the generators will be operational all year round and the annual average impacts can be factored by the calculated allowable operating hours for emergency operation. The allowable operating hours for emergency operation are primarily estimated from a statistical analysis of the likelihood of breaching the 1-hour objective for NO_2 concentrations.

The statistical approach allows for the fact that operation will only occur for a limited number of hours per year, and therefore operation is unlikely to occur during the meteorological conditions giving rise to the highest hourly average concentrations.

Flue heights and diameters were taken from the CAD layout drawings which indicated a flue height of 45.5 m (5.8 m above the building) and flue diameter of 0.57 m. The modelled flue parameters are shown in Table 4-1.

In order to undertake the assessment, each generator was allocated its own flue, with a total of 14 generators. The locations of the flues used in the modelling are shown in Figure 4-1 and the grid references are contained in Appendix C.

Table 4-1: Full Load Emission Data used in the Modelling

Equipment	Flue Height (m)	Flow rate (Am^3/s)	Temp (°C)	Velocity (m/s)	Diameter (m)
1-14 generators	45.5	10.266	510	40.2	0.57

[10] London Borough of Ealing, 2022. London Borough of Ealing Air Quality Annual Status Report for 2022 (V1).
[11] https://uk-air.defra.gov.uk/data/laqm-background-home
[12] https://www.cerc.co.uk/environmental-software/ADMS-model.html

4.2.1.2 Buildings

The following figure illustrates the building layouts, with the flues shown in red. The buildings parameters are described in Appendix C. The data centre building was modelled at 39.7m high.

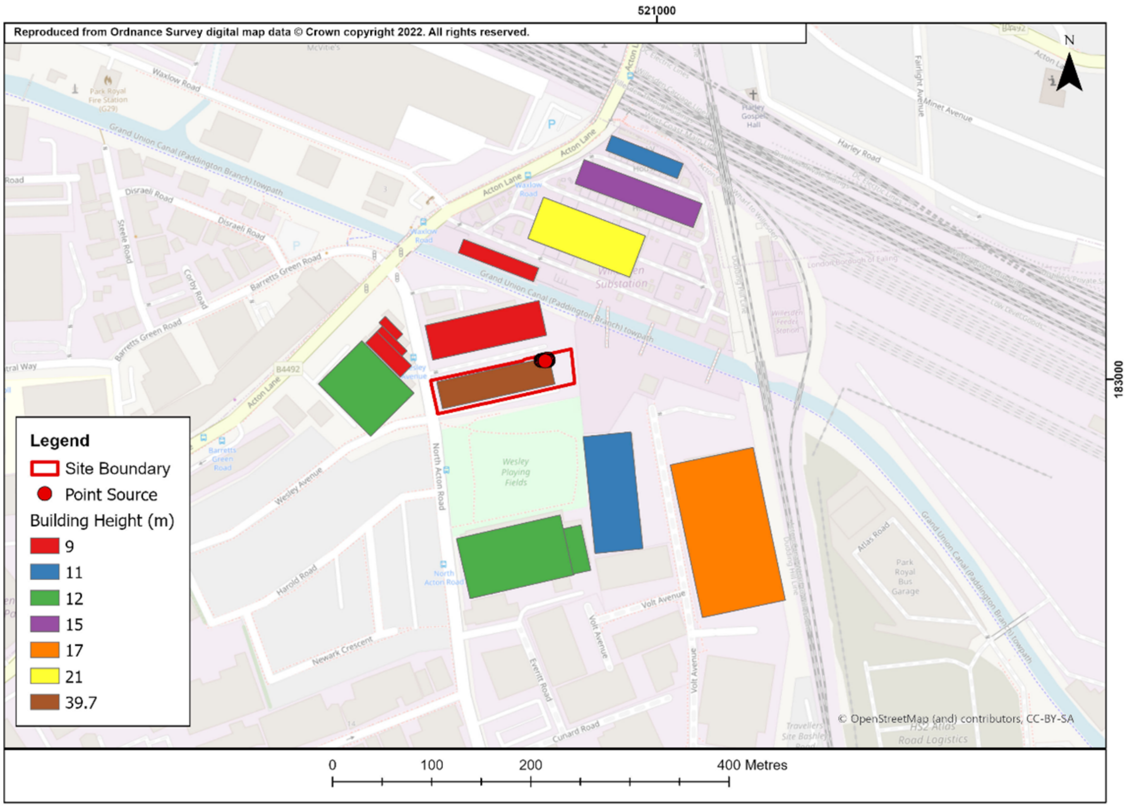


Figure 4-1: Buildings

4.2.1.3 Meteorological Data

The modelling has used 5 years' worth of meteorological data for 2018-2022 from the Heathrow Airport meteorological station which is located approximately 14km to the west of the Site. The results from the year that gave the highest predicted concentrations have been reported in the assessment.

Heathrow Airport was chosen for the assessment as the meteorological data is representative of the conditions in the western portion of London and was the meteorological station used for the planning application for the development. The main alternative station for assessments in London is London City Airport, but this is located further from the site in eastern London where meteorological conditions may be different due to the influence of the urban area of London.

4.2.1.4 Human Health Receptors

Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. Several locations have been identified as receptors for the assessment, both at industrial/commercial and recreation ground locations, (where the 1-hour mean AQO applies) and at residential receptor, hospital and school locations (where both the annual mean and 1-hour mean AQOs apply).

The locations of existing receptors were chosen to represent locations where impacts from the generators are likely to be the greatest. These locations are described in

Table 4-2 and shown in Figure 4-2. Receptors were modelled at varying heights depending on the estimated height of the buildings in which they are located. An average of 3m per floor has been used to estimate building and receptor heights.

In addition to individual receptor points, a grid of receptors was used to illustrate the spatial variation in dispersion in order to visually demonstrate the pattern of dispersion. The grid was modelled at 1.5 m height to show the dispersion pattern at sensitive residential receptors.

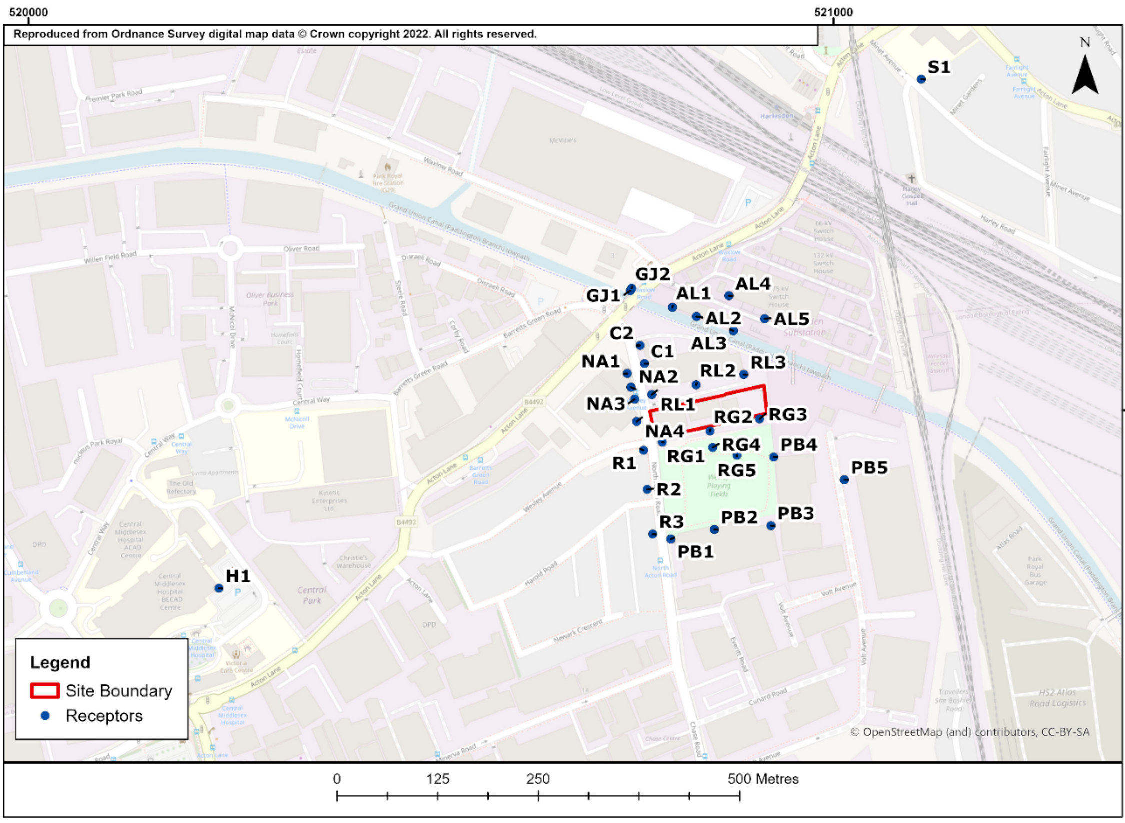


Figure 4-2: Human Health Receptor Locations

Table 4-2: Receptor Locations

Receptor	Location	Type	x	y	Height (m)
RL1	Royal London Industrial Estate, North Acton Road	Commercial/ Industrial	520774	183019	1.5, 9
RL2	Royal London Industrial Estate, North Acton Road	Commercial/ Industrial	520829	183031	1.5, 9
RL3	Royal London Industrial Estate, North Acton Road	Commercial/ Industrial	520888	183044	1.5, 9

Receptor	Location	Type	x	y	Height (m)
C1	North Acton Road	Office/ Commercial	520765	183058	1.5
C2	North Acton Road	Office/ Commercial	520759	183080	1.5
AL1	Willesden Substation, Acton Lane	Commercial/ Industrial	520800	183128	1.5, 9
AL2	Willesden Substation, Acton Lane	Commercial/ Industrial	520830	183116	1.5, 9
AL3	Willesden Substation, Acton Lane	Commercial/ Industrial	520875	183099	1.5, 9
AL4	Willesden Substation, Acton Lane	Commercial/ Industrial	520870	183142	1.5, 21
AL5	Willesden Substation, Acton Lane	Commercial/ Industrial	520914	183114	1.5, 12
GJ1	The Grand Junction Arms, Acton Lane	Public House	520747	183148	1.5
GJ2	The Grand Junction Arms, Acton Lane	Rooms above pub	520749	183151	4.5
NA1	North Acton Road	Commercial/ Industrial	520744	183046	1.5, 9
NA2	North Acton Road	Commercial/ Industrial	520748	183029	1.5, 9
NA3	North Acton Road	Commercial/ Industrial	520753	183014	1.5, 9
NA4	North Acton Road	Commercial/ Industrial	520755	182986	1.5, 12
RG1	Wesley Playing Fields, North Acton Road	Recreation Ground	520787	182960	1.5
RG2	Wesley Playing Fields, North Acton Road	Recreation Ground	520846	182974	1.5
RG3	Wesley Playing Fields, North Acton Road	Recreation Ground	520908	182989	1.5
RG4	Wesley Playing Fields, North Acton Road	Recreation Ground	520850	182954	1.5
RG5	Wesley Playing Fields, North Acton Road	Recreation Ground	520880	182944	1.5
R1	North Acton Road	Residential	520764	182950	1.5

Receptor	Location	Type	x	y	Height (m)
R2	North Acton Road	Residential	520768	182902	1.5
R3	North Acton Road	Residential	520775	182846	1.5
PB1	Powergate Business Park	Commercial/ Industrial	520798	182840	1.5, 12
PB2	Powergate Business Park	Commercial/ Industrial	520852	182852	1.5, 12
PB3	Powergate Business Park	Commercial/ Industrial	520922	182857	1.5, 12
PB4	Powergate Business Park	Commercial/ Industrial	520926	182942	1.5, 11
PB5	Powergate Business Park	Commercial/ Industrial	521013	182914	1.5, 17
H1	Central Middlesex Hospital	Healthcare Facility	520237	182779	1.5
S1	Harlesden Primary School	Educational Facility	521109	183411	1.5

4.2.2 Environment Agency Criteria

4.2.2.1 Specified Generator Guidance

The assessment has principally been carried out following the *EA Emissions from specified generators [Version 1] guidance*[13] and the referenced guidance therein, including the *EA Guidance* for detailed air quality assessments as set out on the *UK Government website*[14].

For dispersion modelling purposes it is assumed that the generators will be operational all year round. The allowable hours for emergency operation are estimated from a statistical analysis of the likelihood of breaching the hourly mean NO_2 AQO (taking into account baseline pollutant concentrations).

Guidance provided by the Environment Agency provides a methodology to assess the probability of exceedances of the hourly mean AQO. The hypergeometric probability distribution test provides an estimate of the probability of breaching the AQO given random use of the generators for a total number of operating hours per year. Table 4-3 shows how the calculated probabilities are judged by the Environment Agency.

The 1% probability is normally used as the benchmark to calculate the allowable operating hours during emergency operation; if the generators had a life of less than 20 years then it may be possible to use the 5% probability level although this does not increase the allowable operating hours significantly.

[13] https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf sourced June 2021.
[14] https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports sourced June 2021.

Table 4-3: Probability Significance for hourly mean AQO

Probability	Significance
1%	Indicates exceedance is highly unlikely
5%	Indicates that exceedance is unlikely provided generator lifetime is less than 20 years
>5%	Indicates potential for exceedance

The annual mean pollutant concentrations are calculated on the assumption that all of the generators will operate in an emergency for the number of hours allowed during emergency operation determined by the probability of exceedance.

4.2.3 Ecological Receptors

Environment Agency screening criteria has been used to select specific ecological receptors for the assessment:

- Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites within 10km; and
- Sites of Special Scientific Interest (SSSIs) and local nature sites (ancient woods, local wildlife sites and national and local nature reserves) within 2km.

The location of the three sites that meet the above criteria is shown in Figure 4-3 and Figure 4-4 and described in Table 4-4.

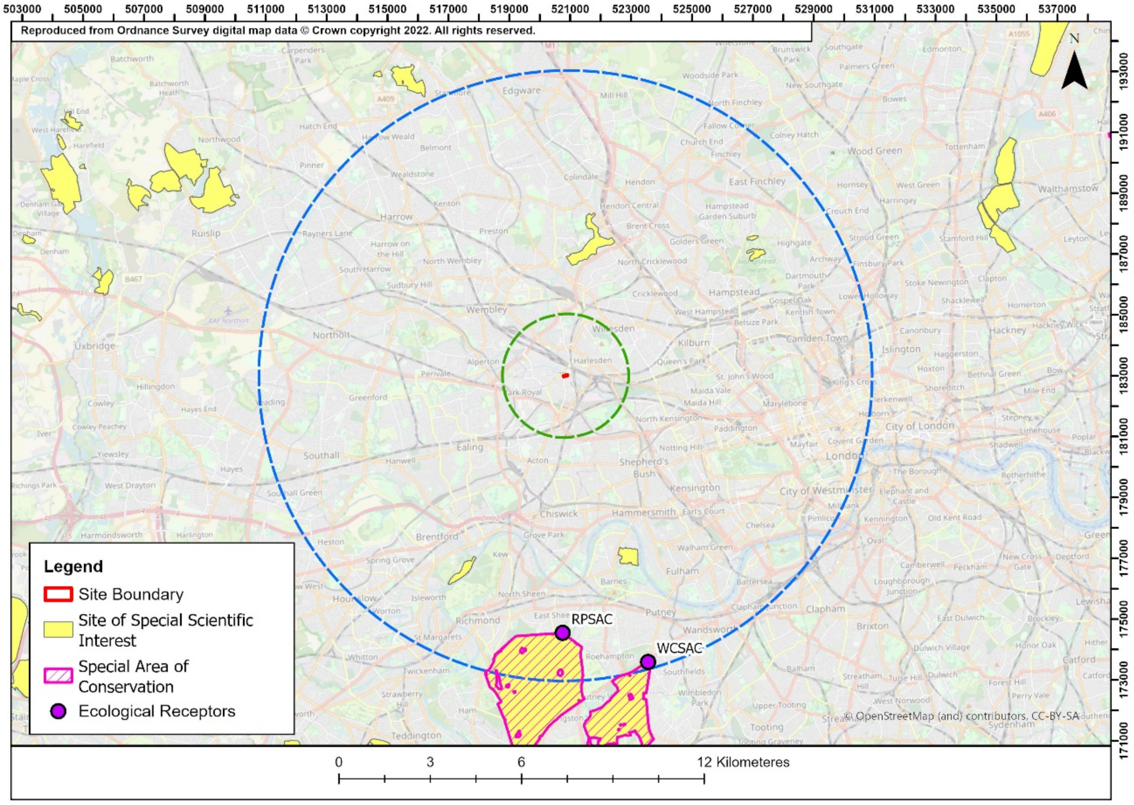


Figure 4-3: Ecological Receptors within 10 km of the Site

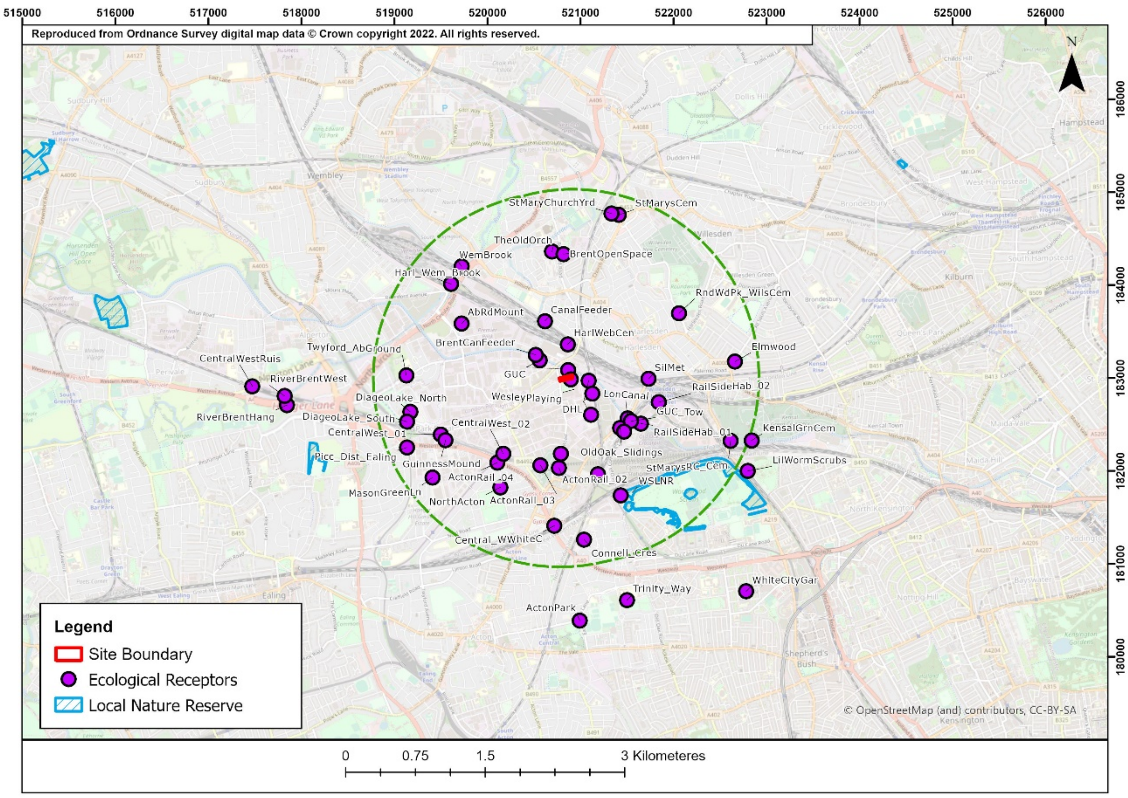


Figure 4-4: Ecological Receptors within 2km of the Site

Table 4-4: Modelled Ecological Habitats

Site Name	Model ID	Designation
Richmond Park	RPSAC	Special Area of Conservation and Site of Specific Scientific Information
Wimbledon Common	WCSAC	Special Area of Conservation Site of Specific Scientific Information
Wormwood Scrubs	WSLNR	Local Nature Reserve
Abbey Road Mound and Bestway Park	AbRdMount	Site of Importance to Nature Conservation
Acton Park & Acton Lane Sports Ground	ActonPark	Site of Importance to Nature Conservation
Acton Railsides	ActonRail_01	Site of Importance to Nature Conservation
Acton Railsides	ActonRail_02	Site of Importance to Nature Conservation
Acton Railsides	ActonRail_03	Site of Importance to Nature Conservation
Acton Railsides	ActonRail_04	Site of Importance to Nature Conservation
Brentfield Open Space	BrentOpenSpace	Site of Importance to Nature Conservation
Canal Feeder	BrentCanFeeder	Site of Importance to Nature Conservation
Canal Feeder	CanalFeeder	Site of Importance to Nature Conservation
Central line west of White City	Central_WWhiteC	Site of Importance to Nature Conservation
Central line west of White City	CentralWest_01	Site of Importance to Nature Conservation
Central Line and Castle Bar	CentralWest_02	Site of Importance to Nature Conservation
Central line west of White City	WhiteCityGar	Site of Importance to Nature Conservation
Connell Crescent Allotments	Connell_Cres	Site of Importance to Nature Conservation
Diageo Lake & Coronation Gardens	DiageoLake_North	Site of Importance to Nature Conservation
Diageo Lake & Coronation Gardens	DiageoLake_South	Site of Importance to Nature Conservation
Elmwood Green	Elmwood	Site of Importance to Nature Conservation
Former Guinness Mounds	GuinnessMound	Site of Importance to Nature Conservation
Harlesden to Wembley Central railsides, including the Wembley Brook	Harl_Wem_Brook	Site of Importance to Nature Conservation
Harlesden to Wembley Central railsides, including the Wembley Brook	HarlWebCen	Site of Importance to Nature Conservation
Harlesden to Wembley Central railsides, including the Wembley Brook	WemBrook	Site of Importance to Nature Conservation

Site Name	Model ID	Designation
Kensal Green Cemetery	KensalGrnCem	Site of Importance to Nature Conservation
Little Wormwood Scrubs Park	LilWormScrubs	Site of Importance to Nature Conservation
London's Canals	GUC_EAST_DHL_01	Site of Importance to Nature Conservation
London's Canals	GUC_North	Site of Importance to Nature Conservation
London's Canals	GUC_Tow	Site of Importance to Nature Conservation
London's Canals	GUC_West	Site of Importance to Nature Conservation
London's Canals	LonCanal	Site of Importance to Nature Conservation
London's Canals	RailSideHab_01	Site of Importance to Nature Conservation
London's Canals	RailSideHab_02	Site of Importance to Nature Conservation
Mason's Green Lane	MasonGreenLn	Site of Importance to Nature Conservation
North Acton Cemetery	NorthActon	Site of Importance to Nature Conservation
North Acton Cemetery	NorthActonCem	Site of Importance to Nature Conservation
Old Oak Common Sidings Birch Wood	OldOak_Sidings_02	Site of Importance to Nature Conservation
Old Oak Sidings	OldOak_Sidings	Site of Importance to Nature Conservation
Piccadilly and District Lines in Ealing	Picc_Dist_Ealing	Site of Importance to Nature Conservation
River Brent at Hanger Lane	RiverBrentHang	Site of Importance to Nature Conservation
River Brent west of Stonebridge	RiverBrentWest	Site of Importance to Nature Conservation
Roundwood Park and Willesden Cemeteries	RndWdPk_WilsCem	Site of Importance to Nature Conservation
Silverlink Metro and Dudding Hill Loop railsides in Ealing	DHL_02	Site of Importance to Nature Conservation
Silverlink Metro and Dudding Hill Loop railsides in Ealing	DHL_03	Site of Importance to Nature Conservation
Silverlink Metro between Brondesbury and Willesden Junction	CentralWestRuis	Site of Importance to Nature Conservation
Silverlink Metro between Brondesbury and Willesden Junction	SilMet	Site of Importance to Nature Conservation
St Mary's Cemetery	StMarysCem	Site of Importance to Nature Conservation
St Mary's Cemetery	StMarysRC_Cem	Site of Importance to Nature Conservation
St Mary's Churchyard, Willesden	StMaryChurchYrd	Site of Importance to Nature Conservation
The Old Orchard	TheOldOrch	Site of Importance to Nature Conservation

Site Name	Model ID	Designation
Trinity Way Recreation Ground	Trinity_Way	Site of Importance to Nature Conservation
Twyford Abbey Grounds	Twyford_AbGround	Site of Importance to Nature Conservation
Wesley Playing fields	WesleyPlaying	Site of Importance to Nature Conservation

5. BASELINE ASSESSMENT

5.1 Local Air Quality Management

LBE has investigated air quality within its area as part of its responsibilities under the LAQM regime. A whole borough AQMA has been declared due to exceedances of the annual mean NO_2 objectives.

5.2 Nitrogen Dioxide Monitoring

LBE deploys NO_2 diffusion tubes at several locations within the borough. The closest and most representative diffusion tube monitoring locations are shown in Figure 5-1 and described in Table 5-1.

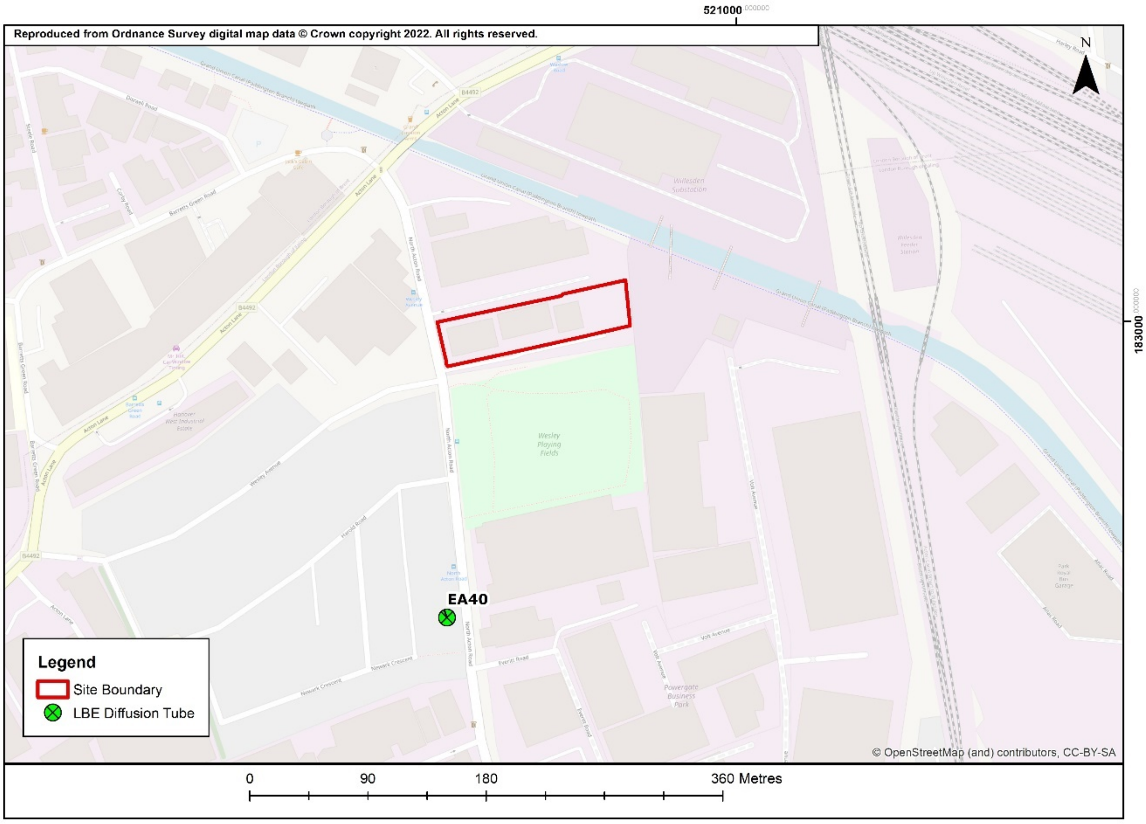


Figure 5-1: Monitoring Locations in the vicinity of the site

Table 5-1: Measured NO_2 Concentrations

Site ID	Site Type	Within AQMA	Annual Mean (µg/m³)						
			2016	**2017**	**2018**	**2019**	**2020***	**2021**	**2022**
EA40	Roadside	Y	38.1	33.4	33.1	30.6	22.0	25.9	25.1
Objective			**40**						

Exceedances of the objective highlighted in bold.
*2020 monitoring data measured during Covid-19 pandemic scenario with restriction to travel imposed and therefore pollutant concentrations are likely to be lower than previous years and are unlikely to be representative of standard conditions.

Measured roadside NO_2 concentrations at diffusion tube EA40 have been in compliance with the annual mean objective from 2016-2022. The data shows a downward trend between 2016 and 2019 which would be expected to continue in the future due to improvements in vehicle emissions and policy measures taken to reduce pollution within London. The impact of the Covid 19 pandemic in 2020 is likely to reduce pollutant concentrations making measured data during this period unrepresentative of long term trends.

5.3 Background Concentrations

In addition to measured concentrations, estimated background concentrations have been obtained from the national maps provided by Defra[15] (shown in Table 5-2). The mapped background concentrations were calibrated against background concentrations measured at the EA03 diffusion tube and KC1 automatic monitoring sites (see Appendix D for more details).

Table 5-2: Estimated Annual Mean Background Concentrations

Year	Location	Annual Mean (µg/m³)	
		NO_x	**NO_2**
2023	520500 183500	38.5	20.0
	521500 182500	34.2	18.3
	520500 182500	37.2	19.6
	521500 183500	34.0	18.2
	520500 174500	22.1	12.8
	523500 173500	26.5	15.1
	521500 181500	32.0	17.5
Objectives		**30***	**40**

*Relevant for ecological receptors

5.4 Baseline Concentrations used in the assessment

5.4.1 Human Health Receptors

The closest receptor locations to the Site are the industrial and commercial buildings on North Acton Lane to the north and west of the Site and Wesley Playing Fields to the south. These locations are not immediately adjacent to busy roads and are typical of urban background

[15] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018 [Accessed September 2023]

locations. The Defra predicted background concentrations for these locations in 2022 are relatively low and significantly lower than the measured concentrations at EA40.

On a conservative basis, the 2022 measured concentration at EA40 (25.1µg/m^3) has been used to represent the annual mean baseline NO_2 concentration for the assessment. This will be conservative for elevated receptor locations where the concentration will reduce to background levels, and also conservative regarding the future concentrations which will be lower.

For hourly mean concentrations, in accordance with Environment Agency guidance, a value of twice the annual mean has been used, 50.2µg/m^3.

In order to assess the number of operating hours equal to a 1% chance of exceeding the 1 hour mean objective, the modelling has used a NO_2 predicted environmental concentration of 200µg/m^3. With a baseline of 50.2µg/m^3, the allowable NO_2 process contribution (PC) (i.e. from the development) is 149.8µg/m^3 which is equivalent to a NO_x concentration of 428µg/m^3.

5.4.2 Ecological Receptors

For the ecological receptors, the background date in Table 5.2 has been used for NO_x concentrations. For nitrogen and acid deposition, the results of the modelling show that the PCs are insignificant and therefore the baseline deposition data is not relevant to the assessment.

6. ASSESSMENT OF IMPACTS

6.1 Human Health Receptors

6.1.1 Emergency Operation

The modelling has been undertaken to determine the emergency operation with a 1% probability of exceeding the objective.

Table 6-1 shows the results of the modelling for the highest impacted receptor for any of the assessed residential, commercial and industrial receptor locations in the vicinity of the development. The results for assessed the receptors are presented in Appendix F.

Table 6-1: Probability of exceeding 1 hour mean NO_2 objective

Operating hours	1% probability	5% probability
	276	324

The allowable operating hours for a 1% probability of exceeding the objective would be 276 hours. If the LHR21 generators were to operate for 324 hours the probability of exceedance would be 5% indicating that exceedances are unlikely provided the lifetime of the generators is less than 20 years.

A contour plot of the probability of exceeding the objective illustrating the pattern of dispersion for the worst-case year is shown in Figure 6-1. The maximum probability occurs to south of the Site. The areas of 1% probability are small with much lower probabilities outside of the areas of maxima.

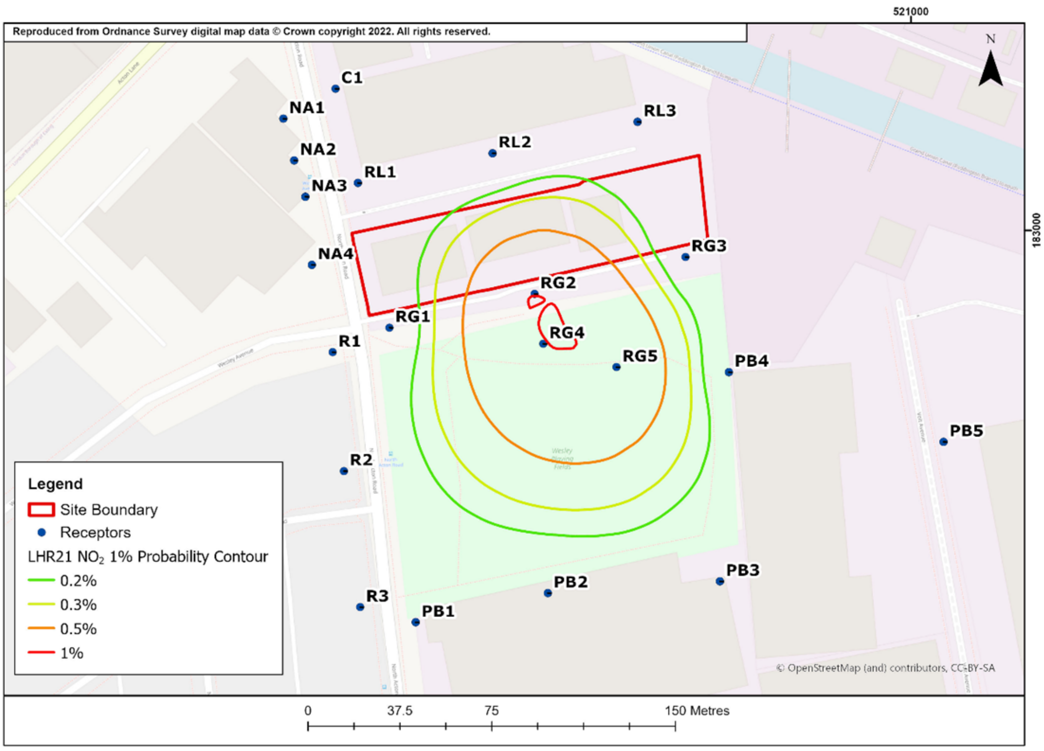


Figure 6-1: NO_2 1% probability of exceeding the 1 hour mean NO_2 objective.

6.1.1.1 Long term impacts

The results from the hypergeometric analysis (Table 6-1) show that the allowable operating hours in an emergency are far higher than those which would actually be required as this suggests a total loss of grid power to this area of London for over 10 days. As such, the annual mean impacts have been factored to assume the emergency generators will run for 72-hours or three days. It is considered that the predicted impacts are conservative as it would require a loss of grid power to this area of London for 3 days in a year.

Table 6-2: Predicted Annual Mean NO_2 Concentrations (µg/m³)

Receptor	Height (m)	NO_2 Process Contribution (µg/m³)	% Change in concentration relative to AQO	Background NO_2 (µg/m³)	Annual Mean NO_2 (µg/m³)	PEC as % of EAL
R1	1.5	0.007	0.017	25.1	25.1	62.8
R2	1.5	0.009	0.023	25.1	25.1	62.8
R3	1.5	0.009	0.022	25.1	25.1	62.8
H1	1.5	0.001	0.003	25.1	25.1	62.8
S1	1.5	0.004	0.011	25.1	25.1	62.8
Grid max (520859, 182985)	1.5	0.6	1.5%	25.1	25.7	64.3
Objective		**40**				-

Figure 6-2 shows the maximum annual mean NO2 concentrations during an emergency for 72 hours operation. The contours are the maximum PC from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year Whilst the annual mean NO_2 concentration is only relevant at locations where there are likely to be receptors present for long periods of time, e.g. residential receptors, the grid maximum PEC is less than 70% of the assessment level.

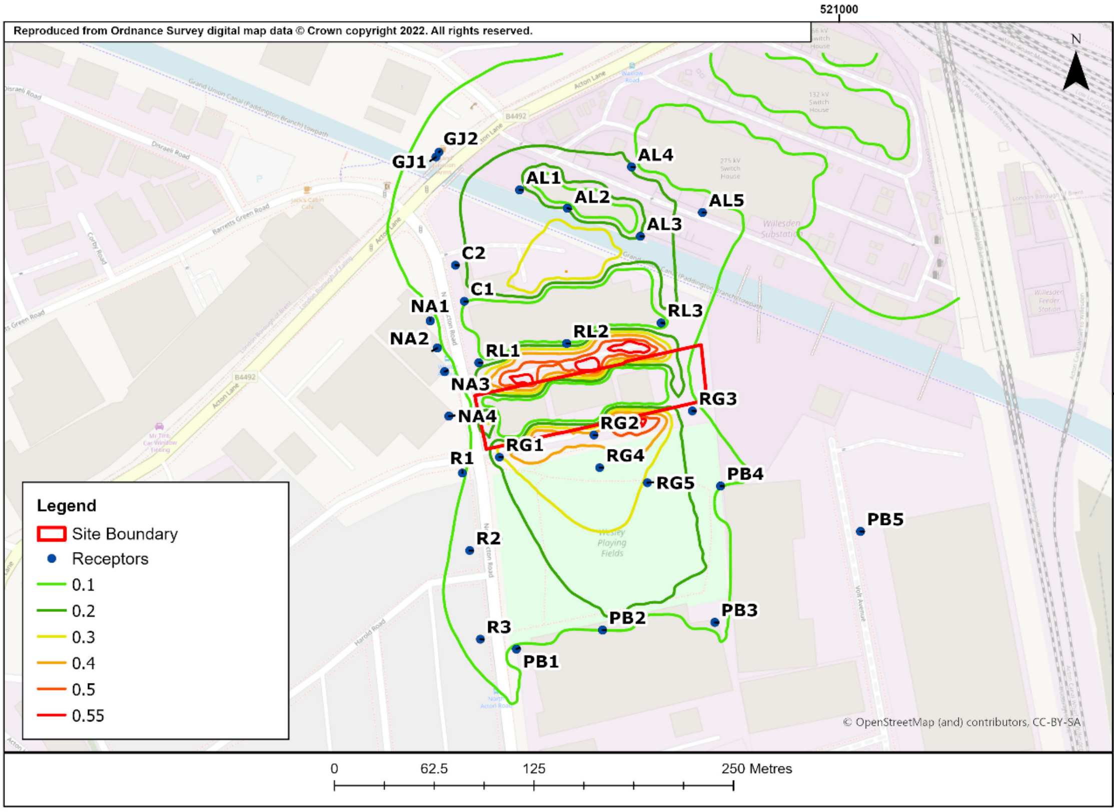


Figure 6-2: Annual Mean NO_2 Process Contribution for 72 hour operation

6.1.1.2 Nitrogen Dioxide predicted 100th Percentile

Table 6-3 shows the largest predicted 100%ile hourly mean NO_2 PEC concentrations during the emergency scenario in relation to the DAQI and AEGL. Full results shown in Appendix F.

Table 6-3: Predicted 100th percentile NO_2 Concentrations for Emergency Operation (µg/m³)

Receptor	Height (m)	1 hour average		
		µg/m³	AEGL	DAQI Level
RG5	1.5	349.4	Below AEGL-1	6
PB2_GF	1.5	349.4	Below AEGL-1	6
PB2_TF	12	349.4	Below AEGL-1	6
PB3_GF	1.5	349.4	Below AEGL-1	6
PB3_TF	12	349.4	Below AEGL-1	6
PB4_GF	1.5	349.4	Below AEGL-1	6
PB4_TF	11	349.4	Below AEGL-1	6
AL5_GF	1.5	340.1	Below AEGL-1	6

AL5_TF	12	340.1	Below AEGL-1	6
GJ_1	1.5	340.1	Below AEGL-1	6
Grid Max 520839 182857*	1.5	349.4	Below AEGL-1	6

*Located to the north east of the site on the opposite side of the canal

Figure 6-3 shows the predicted 100%ile hourly mean NO_2 concentration during emergency scenario. The results are for the stacks that gave rise to the maximum ground level concentrations. The contours are the maximum results from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year.

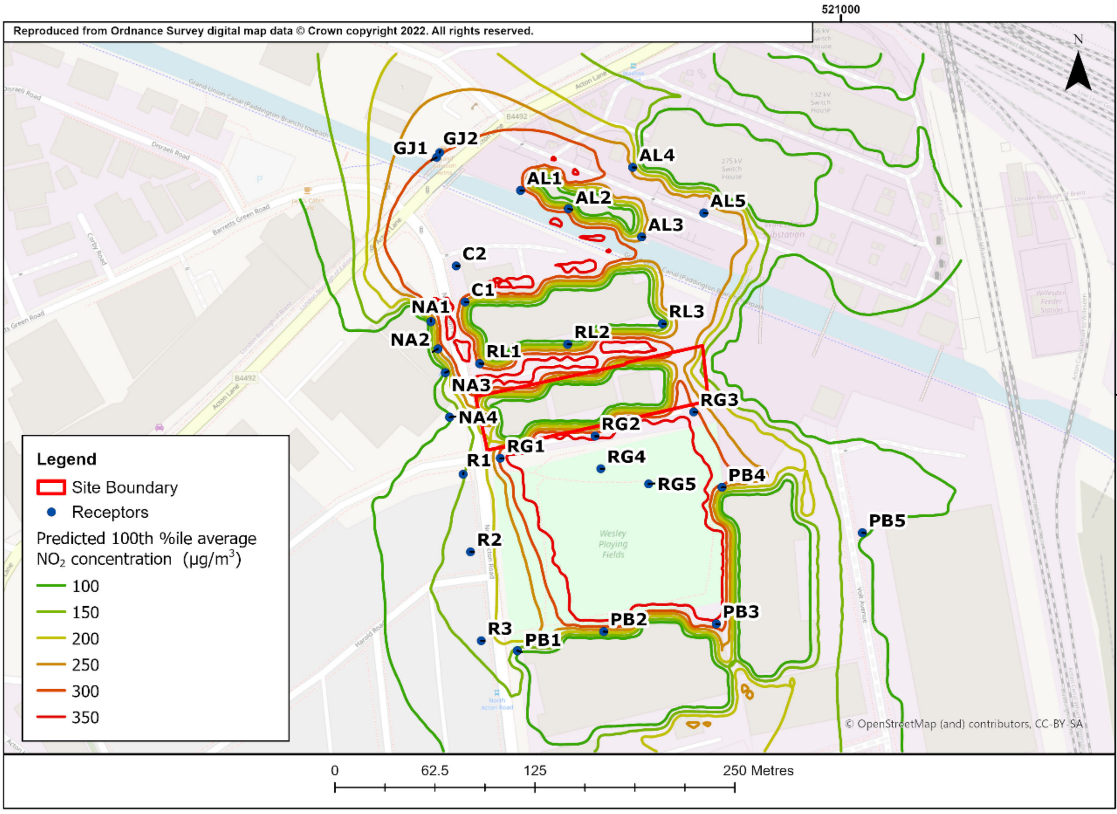


Figure 6-3: 100th Percentile NO_2 PEC concentrations for Emergency scenario

The maximum predicted concentration occurs immediately north and south of the LHR21 building, isolated within the Wesley Playing fields to the south and dispersed north over Park Royal. The assessed receptor locations all have concentrations less than AEGL-1.

PM_{10} and $PM_{2.5}$

The highest maximum daily 90.41th percentile process contribution at modelled receptors from any of the 5 years of meteorological data are presented in Table 6-4 for the emergency operation. Full results shown in Appendix F.

Table 6-4: Daily 90.41th percentile PM_{10} Concentrations

Receptor	Height (m)	EAL µg/m³	Background Concentration µg/m³	PC µg/m³	PC as % of the EAL
RG4	1.5	50	33.3	2.3	4.7%
RG2	1.5	50	33.3	2.3	4.6%
RL2_GF	1.5	50	33.8	2.1	4.2%
RL2_TF	9	50	33.8	2.1	4.2%
RG5	1.5	50	33.3	2.0	4.1%
AL2_TF	9	50	33.8	1.6	3.1%
AL2_GF	1.5	50	33.8	1.6	3.1%
AL1_TF	9	50	33.8	1.5	2.9%
PB2_TF	12	50	33.8	1.5	2.9%
AL1_GF	1.5	50	33.3	1.5	2.9%
Grid Max (520810, 182975)	1.5	50	33.3	2.5	5.0%

The maximum PC Daily PM_{10} is less than 10% of the critical level, no further consideration of the PEC is required.

Due to low operating hours, the maximum predicted annual mean PM concentration is 0.01µg/m³ and therefore less than 1% of the annual mean EALs for PM_{10} and $PM_{2.5}$. Full results can be found in Appendix F.

6.1.2 Testing

This section contains the results of the testing. The modelling assumes that each generator will be tested for 2-hours per month over the course of a year. The model was set up using one representative emission point (i.e. flue). The annual mean results have been factored representing an annual running time of 336 hours. The highest results are reported. Given assumed intermittent operation and short duration of the testing the maximum predicted hourly mean concentrations are unlikely to occur in reality.

6.1.2.1 Long term impacts

The maximum predicted annual mean NO_2 concentrations for all assessed receptor locations that are relevant for annual mean (Residential areas, schools and hospitals) for the testing scenario are presented in Table 6-5.

Table 6-5: Predicted Annual Mean NO_2 Concentrations (µg/m³)

Receptor	Height (m)	NO_2 Process Contribution (µg/m³)	% Change in concentration relative to AQO	Background NO_2 (µg/m³)	Annual Mean NO_2 (µg/m³)	PEC as % of EAL
R1	1.5	0.03	0.08	25.1	25.13	62.8
R2	1.5	0.04	0.11	25.1	25.14	62.9
R3	1.5	0.04	0.10	25.1	25.14	62.9
H1	1.5	0.01	0.01	25.1	25.10	62.8
S1	1.5	0.02	0.10	25.1	25.10	62.8
Grid Max (52085, 182985)	1.5	0.20	0.51	25.1	25.03	63.3
Objective		**40**				-

The maximum PCs at all locations are less than 1% and are therefore not significant.

Figure 6-4 shows the maximum annual mean NO_2 concentrations during a testing scenario. The contours are the maximum PC from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year.

The impact on annual mean NO_2 concentration is described as not significant at all relevant receptors.

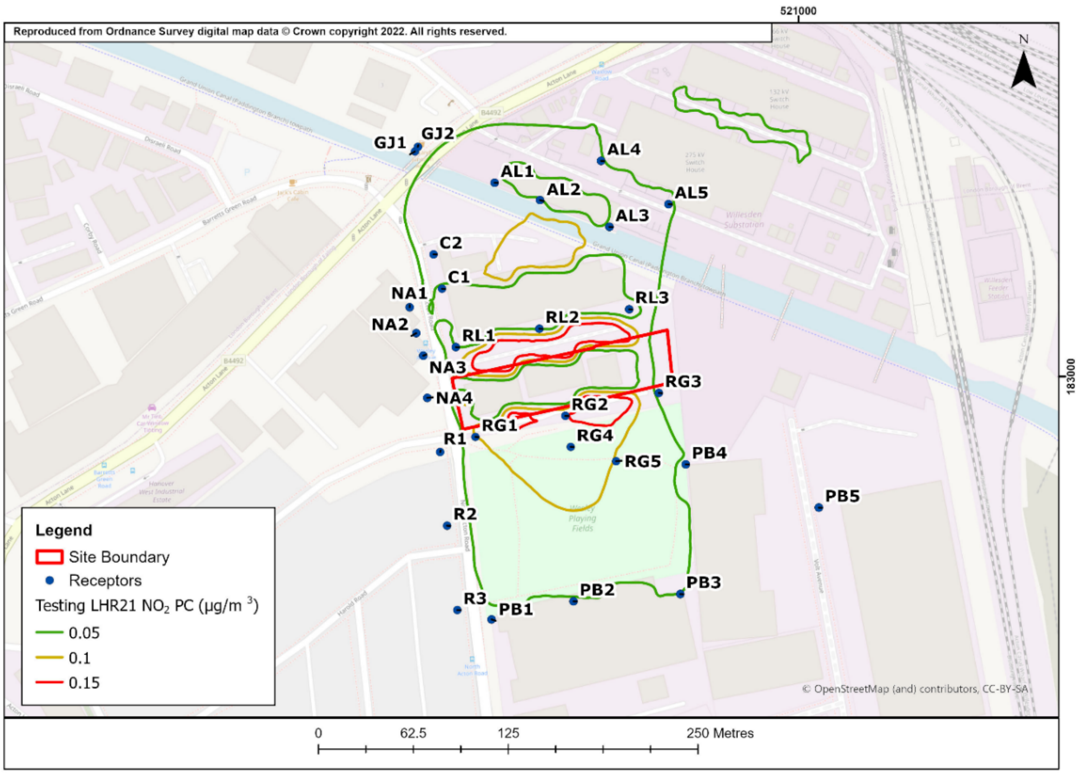


Figure 6-4: Testing Annual Mean NO_2 PC

6.1.2.2 Nitrogen Dioxide predicted 100th Percentile

Table 6-6 shows the predicted 100%ile hourly mean NO_2 concentration during testing in relation to the DAQI and AEGL. Full results are shown in Appendix F.

Table 6-6: Predicted 100th percentile NO_2 Concentrations for Testing Operation (µg/m³)

Receptor	Height (m)	1 hour average		
		µg/m³	AEGL	DAQI Level
RG2	1.5	74.8	Below AEGL-1	1
RG4	1.5	74.8	Below AEGL-1	1
RG5	1.5	74.8	Below AEGL-1	1
RL2_TF	9	74.1	Below AEGL-1	1
RL2_GF	1.5	74.1	Below AEGL-1	1
Grid Max 520849 183015	1.5	74.8	Below AEGL-1	1

Figure 6-5 shows the predicted 100%ile hourly mean NO_2 concentration during generator testing. The results are for the stacks that gave rise to the maximum ground level concentrations. The contours are the maximum results from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year.

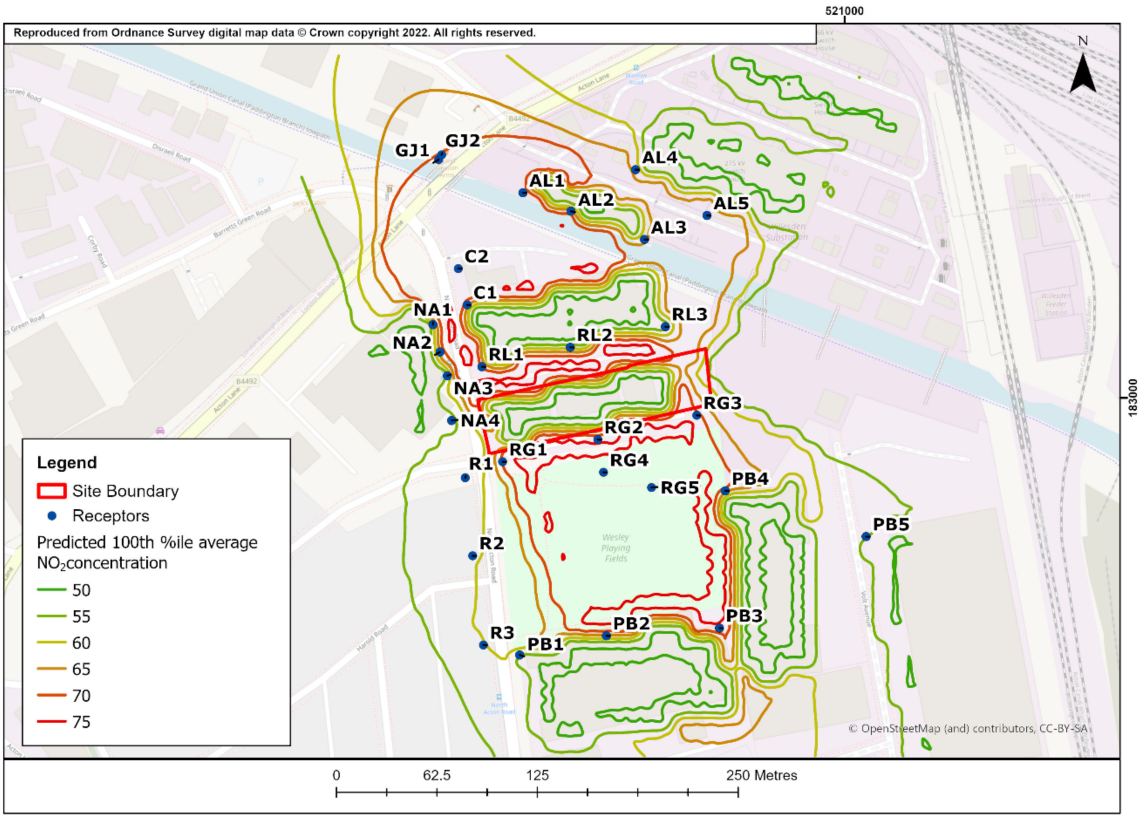


Figure 6-5: 100th Percentile NO_2 PEC concentrations for testing scenario

The maximum predicted concentration during the testing scenario follows a similar pattern as the emergency scenario; immediately north and south of the LHR21 building, isolated within the Wesley Playing fields to the south and dispersed north over Park Royal. All the predicted concentrations are less than AEGL-1.

6.2 Ecological Receptors

6.2.1 Emergency Scenario

6.2.1.1 Annual Mean

Predicted NO_x concentrations within the ecological receptors are shown in Table 6-7. The predicted concentrations assume that all the emergency generators operate for a period of 276 hours.

Table 6-7: Ecological Receptors Predicted Annual Mean NO_x Concentrations (µg/m³)

Receptor	Critical Level (µg/m³)	PC (µg/m³)	PC % of Critical Level
Richmond Park SAC	30	0.003	0.009%
Wimbledon Common SAC	30	0.002	0.006%

The maximum predicted NO_x PCs at all the assessed ecological sites are well below 1% of the critical level, as such they are not significant.

6.2.1.2 Daily mean NO_x

Predicted daily mean NO_x process contribution at modelled designated habitats and the highest predicted PC at modelled local nature reserves from any of the 5 years of meteorological data are presented in Table 6-8 for the emergency operation. Full modelled results are presented in Appendix F.

Table 6-8: Ecological Receptors Predicted Daily NO_x Concentrations (µg/m³)

Model receptors	Critical Level (µg/m³)	PC (µg/m³)	PC % of Critical Level
RPSAC	75	1.09	1%
WCSAC	75	1.54	2%
GUC_EAST_DHL_01	75	**82.7**	**110%**
GUC_North	75	**345.5**	**461%**
WesleyPlaying	75	**445.2**	**594%**

Figure 6-6 shows the predicted 100%ile daily mean NO_x concentration during the emergency scenario.

The daily mean NO_x PC is below 10% for Richmond Park SAC and Wimbledon Common and is therefore not significant for these sites.

The daily mean NO_x is over 100% for three of the modelled ecological receptors therefore potentially significant and this is discussed further below. Whilst the grid maximum is presented, it is only relevant for locations where there are ecological receptors present.

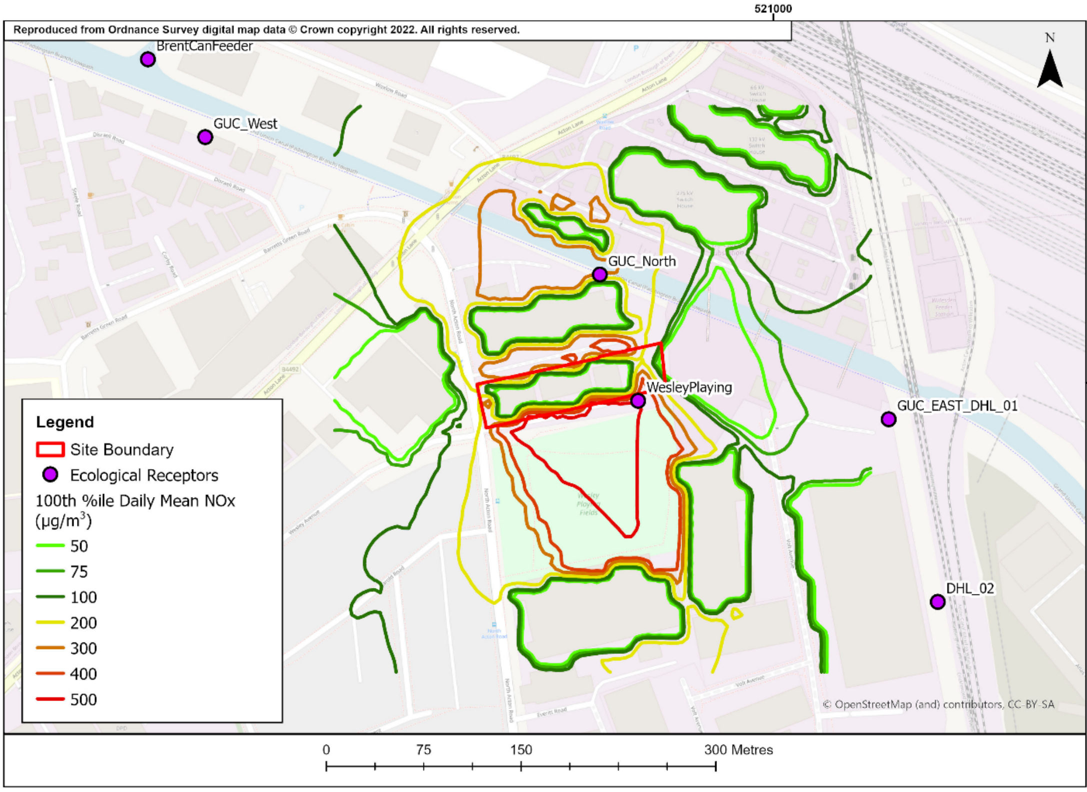


Figure 6-6: Emergency Scenario Daily Mean NO_x PC

6.2.1.3 Ecological Habitats Daily Mean NO_x exceedances

Table 6-9 presents the total number of days where the daily mean NO_x PC is predicted to be above the AQO at the ecological habitats for each modelled year.

Table 6-9: Wormwood Scrubs number of Daily Mean NO_x PC exceedances

ID	2018	2019	2020	2021	2022	Maximum
GUC_EAST_DHL_01	3	2	0	0	0	3
GUC_North	90	84	98	87	101	101
WesleyPlaying	9	44	31	45	52	52

At GUC_EAST_DHL_01 the daily mean was only exceeded in two of the modelled years and then only for a maximum of 3 days in the year.

For the other sites, the frequency of exceedance varies, with the maximum at GUC_North of 101 days, or approximately 28% of the year. Whilst the annual mean NO_2 impacts have been predicted on the assumption of 3 days continuous operation in an emergency, this in itself is unlikely to occur given the grid reliability in this area of London such that emergency operation is unlikely to last for 24 hours.

6.2.1.4 Nitrogen Deposition

Predicted nitrogen deposition for Richmond Park, Wimbledon Common and Wormwood Scrubs for Broadleaved, Mixed and Yew Woodland habitat and Dry Heaths are shown in Table 6-10.

Table 6-10: Predicted Nitrogen Deposition for Habitats during the Emergency Scenario

Site	Nitrogen Depositon (kgN/ha/ yr)				PC % of Critical Load
	Critical Load	NO_2 depostion PC	NH_3 Deposition PC	Total PC	
Richmond Park SAC (Forest)	10	0.00052	0.00252	0.00304	0.030%
Wimbledon Common SAC (Forest)	10	0.00035	0.00005	0.00040	0.004%
Wimbledon Common SAC (Grassland)	5	0.00017	0.00004	0.00021	0.004%

The maximum contribution to nitrogen deposition does not exceed 1% of the critical load for both Woodland and Dry Heath and is therefore not significant.

6.2.1.5 Acid Deposition

Predicted acid deposition for Richmond Park, Wimbledon Common and Wormwood Scrubs for Broadleaved, Mixed and Yew Woodland habitat and Dry Heaths are shown in Table 6-11.

Table 6-11: Predicted Acid Deposition for Habitats during the Emergency Scenario

Site	Acidity Critical Load (keq/ha/yr)		Acid Deposition PC (keq/ha/yr)			PC (% Critical Load)
	N	S	NO_2	NH_3	Total	
Richmond Park SAC (Forest)	0.142 – 1.009	0.724	0.000037	0.000179	0.000216	0.021%
Wimbledon Common SAC (Forest)	0.285 – 1.008	0.723	0.000025	0.000004	0.000029	0.003%

Site	Acidity Critical Load (keq/ha/yr)		Acid Deposition PC (keq/ha/yr)			PC (% Critical Load)
Wimbledon Common SAC (Grassland)	0.642 – 0.872	0.230	0.000012	0.000003	0.000015	0.002%

The maximum predicted total acid deposition is below 1% of the critical load function at all assessed habitats, and therefore no further consideration needs to be given.

6.2.2 Testing

6.2.2.1 Annual Mean

Predicted NO_x concentrations within the ecological receptors are shown in Table 6-12. The predicted annual mean concentrations assume that each generator will be tested for two-hours a month over the course of a year.

Table 6-12: Ecological Receptors Predicted annual mean NO_x Concentrations (µg/m³)

Receptor	Critical Level (µg/m³)	PC (µg/m³)	PC % of Critical Level
Richmond Park SAC	30	0.0002	0.0%
Wimbledon Common SAC	30	0.0002	0.0%

The maximum predicted NO_x PCs at all the assessed ecological sites is well below 1% of the critical level, as such they are not significant.

6.2.2.2 Short Term

Table 6-13: Ecological Receptors Predicted Daily NO_x Concentrations (µg/m³)

Receptor	Critical Level (µg/m³)	PC (µg/m³)	PC % of Critical Level
Richmond Park SAC	75	0.08	0.1%
Wimbledon Common SAC	75	0.11	0.1%

The predicted modelled PCs are less than 10% of the critical level for all assessed habitats. The short-term concentrations are unlikely to give rise to significant impacts.

6.2.2.3 Nitrogen Deposition

Predicted nitrogen deposition for Richmond Park, Wimbledon Common and Wormwood Scrubs for Broadleaved, Mixed and Yew Woodland habitat and Dry Heaths are shown in Table 6-14.

Table 6-14: Predicted Nitrogen Deposition for Habitats during the testing Scenario

Site	Nitrogen Depositon (kgN/ha/ yr)				PC % of Critical Load
	Critical Load	NO_2 Depostion PC	NH_3 Deposition PC	Total PC	

Site	Nitrogen Depositon (kgN/ha/ yr)				PC % of Critical Load
Richmond Park SAC (Forest)	10	0.000045	0.00002	0.00007	0.0007%
Wimbledon Common SAC (Forest)	10	0.000030	0.00001	0.00004	0.0004%
Wimbledon Common SAC (Grassland)	5	0.000015	0.00001	0.00002	0.0005%

The maximum contribution to nitrogen does not exceed 1% of the critical load for both Woodland and Dry Heath and is therefore Not Significant.

6.2.2.4 Acid Deposition

Predicted acid deposition for Richmond Park, Wimbledon Common and Wormwood Scrubs for Broadleaved, Mixed and Yew Woodland habitat and Dry Heaths are shown in Table 6-15.

Table 6-15: Predicted Acid Deposition for Habitats during the Testing Scenario

Site	Acidity Critical Load (keq/ha/yr)		Acid Deposition PC (keq/ha/yr)			PC (% Critical Load)
	N	S	NO_2	NH_3	Total	
Richmond Park SAC (Forest)	0.142 – 1.009	0.724	0.000003	0.000002	0.000005	0.0005%
Wimbledon Common SAC (Forest)	0.285 – 1.008	0.723	0.000002	0.000001	0.000003	0.0003%
Wimbledon Common SAC (Grassland)	0.642 – 0.872	0.230	0.000001	0.000001	0.000002	0.0002%

The maximum predicted total acid deposition is below 1% of the critical load function at all assessed habitats, and therefore no further consideration needs to be given.

7. CONCLUSIONS

An assessment of the impacts of the emissions from the emergency generators at LHR21 has been undertaken.

For the emergency operation, impacts of CO and SO_2 screen out from modelling as being insignificant. For testing, impacts of PM_{10} and $PM_{2.5}$ also screen out.

In an emergency scenario the emergency generators can operate up to 276 hours per year with a 1% probability of exceeding the short term NO_2 objective. Predicted annual mean NO_2 impacts have been factored to 72 hours to represent a maximum emergency scenario. Predicted annual mean NO_2 at all relevant receptor locations are not significant.

Impacts at ecological sites are potentially significant during the emergency scenario for daily mean NO_x concentrations, however, is it unlikely that the generators would be running for more than 24 hours.

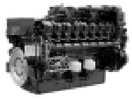
Impacts during testing are lower than in an emergency scenario and are not significant.

APPENDIX 1
GLOSSARY

Abbreviations	Meaning
ADMS	Air Dispersion Modelling System
APIS	Air Pollution Information System
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CO	Carbon monoxide
Defra	Department for Environment, Food and Rural Affairs
Diffusion Tube	A passive sampler used for collecting NO_2 in the air
EA	Environmental Agency
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
AQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen Dioxide
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO_2
PM_{10}/$PM_{2.5}$	Small airborne particles less than 10/2.5 microns in aerodynamic diameter
Receptor	A location where the effects of pollution may occur
SSSI	Site of Special Scientific Interest
SO_2	Sulphur dioxide
SPA/SAC	Special Protection Areas (SPAs) and Special Areas of Conservation (SAC)

APPENDIX 2
GENERATOR TECHNICAL DATA

ENGINE DATASHEET



KOHLER

Engine ref. : KD83V16-5CES

General technical data

Cylinders configuration	V
Number of cylinders	16
Engine optimisation	Emission optimisation
Dual Frequency	Yes
Speed (RPM)	1500
Speed (RPM)	1800
Displacement (l)	82.74
Bore (mm)	175
Stroke (mm)	215
Compression ratio	16 : 1
Engine Firing Order	A1-B7-A2-B5-A4-B3-A6-B1-A8-B2-A7-B4-A5-B6-A3-B8
Air inlet system	Turbo
Fuel	Diesel Fuel

Performance

RPM	1500	1800
Maximum stand-by power at rated RPM (kW)	3007	3007
PRP Power (kW)	2734	2734
Pistons speed (m/s)	10.75	12.90
BMEP @ ESP 50 Hz (bar) / BMEP @ ESP 60 Hz (bar)	29.10	24.20
Friction Power Loss (kW)	240	354
Max Combustion Pressure (Mpa)	240	

Electrical system

Governor type	Electronic
ECU type	KODEC
Frequency regulation, no-load to full-load	Isochrone
Frequency regulation, steady state (%)	+/- 0.25%
No. of teeth on ring gear	182
Idle speed (RPM)	650
Battery voltages (V)	24
Charging alternator (V/Ah)	24 / 28 / 140
Starter characteristics (V/kW)	2 * (24 / 9)

Dimensions and weight

Length (mm)	3240
Width (mm)	1777
Height (mm)	2125
Dry weight (kg)	11300
Wet weight (kg)	12157
Center of Gravity from Rear Face of Block (mm)	-1200

33514138502-A_EN
STATUS : ACTIF
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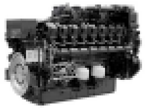
ENGINE DATASHEET

Engine ref. : KD83V16-5CES



KOHLER

Construction / Material

Main Bearing Type	Half shell bearing
Cylinder Head Material	Cast Iron
Crankshaft Material	Steel
Intake and Exhaust Valve Material	Steel
Piston type & material	Steel
Exhaust manifold type	Dry

Installation

Maximum Bending Moment at Rear Face of Block (RFOB) (Nm)	
Maximum Rear Bearing Load (N)	
Maximal engine inclination, longitudinal front up/down (degree)	10
Maximal engine inclination, lateral (degree)	15
SAE Flywheel housing	00
SAE Flywheel	21
Inertia (kg.m²)	42.10

Fuel system

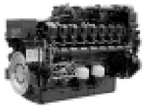
RPM	1500	1800
Maximum fuel pump flow (l/h)	1070	
Max. restriction at fuel pump (m)	3.50	
Max head on fuel return line (m)	3.50	
Maximum allowed inlet fuel temperature (°C)	70	
Primary fuel filter rating (micron)	5	
Fuel Prefilter / Water Separator Micron Size	10	
Fuel Inlet Minimum recommended size (mm)	33.70	
Fuel Outlet Minimum recommended size (mm)	33.70	

Fuel consumption (Specific fuel consumption +5% ; ISO3046-1 ; 42.7 MJ/kg)

RPM	1500	1800
Specific consumption 25% PRP load (g/kW.h)	262	
Specific consumption 50% PRP load (g/kW.h)	226	
Specific consumption 75% PRP load (g/kW.h)	211	
Specific consumption 100% PRP load (g/kW.h)	204	
Specific consumption 25% ESP load (g/kW.h)	257	253
Specific consumption 50% ESP load (g/kW.h)	223	
Specific consumption 75% ESP load (g/kW.h)	211	199
Specific consumption 100% ESP load (g/kW.h)	200	198

Lubrication system

ENGINE DATASHEET



KOHLER

Engine ref. : KD83V16-5CES

RPM	1500	1800
Oil consumption 100% ESP 50Hz (l/h)	1.42	1.42
Oil system capacity including filters (l)	560	
Oil sump capacity (l)	460	
Oil capacity between dipstick marks Max-Min (l)	83	
Min. oil pressure (bar)		
Oil Pressure at rated speed (bar)	4.50	
Max. oil pressure (bar)		
Oil temperature maximum (°C at 25°C ambient)	100	
Oil filter micron size	10	
Oil Filter Quantity and type	Spin On / 8	
Oil cooler	Plate Exchanger	

Air intake system

RPM	1500	1800
Intake air flow (l/s)	3720.58	4027.66
Max. intake restriction (mm H2O)	510	
Maximum air filter temp without derating (°C)	65	

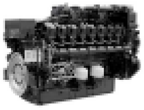
Exhaust system

RPM	1500	1800
Heat rejection to exhaust (kW)	2090	1950
Max. exhaust back pressure (mm H2O)	867	
Exhaust gas temperature @ ESP 50Hz (°C)	510	
Exhaust gas temperature @ ESP 60Hz (°C)	400	
Exhaust gas flow @ ESP 50Hz (l/s)	10266	
Exhaust gas flow @ ESP 60Hz (l/s)	9523	

Cooling system

RPM	1500	1800
Radiated heat to ambiant (kW)	140	140
Heat rejection to coolant HT (kW)	1100	1110
Flow on the HT circuit at 0.7Bars pressure drop off engine (l/min)	1980	2480
Heat rejection to coolant LT (kW)	820	860
Flow on the LT circuit at 0.7Bars pressure drop off engine (l/min)	620	810
Temperature of inlet to LT engine water circuit (°C)	55	
Outlet coolant temperature (°C)	85	
Maximum Coolant temp without derating (°C)	100	
Max coolant temperature, Shutdown (°C)	105	
Coolant capacity HT, engine only (l)	270	
Restriction pressure drop off engine – HT circuit (mbar)	700	
Minimal pressure before HT pump (mbar)	400	

ENGINE DATASHEET



KOHLER

Engine ref. : KD83V16-5CES

Max. pressure at inlet of HT water pump (mbar)	2500
Thermostat begin of opening HT (°C)	71
Thermostat end of opening HT (°C)	81
HT Standard pressure cap setting (kPa)	100
Coolant capacity LT, engine only (l)	105
Restriction pressure drop off engine – LT circuit (mbar)	700
Minimal pressure before LT pump (mbar)	400
Max. pressure at inlet of LT water pump (mbar)	2500
Thermostat begin of opening LT (°C)	45
Thermostat end of opening LT (°C)	57
LT Standard pressure cap setting (kPa)	100
Water Pump Type	Vane Wheel pump

Charge air cooling system

ENGINE INFORMATION

Model:	KD83V16	Bore:	175 mm (6.89 in.)
Type:	4-Cycle, 16-V Cylinder	Stroke:	215 mm (8.46 in.)
Aspiration:	Turbocharged, Intercooled	Displacement:	83 L (5048 cu. in.)
Compression ratio:	16:0:1		
Emission Control Device:	Direct Diesel Injection, Engine Control Module, Turbocharger, Charge Air Cooler		

EXHAUST EMISSION DATA:		EPA D2 Cycle 5-mode weighted
HC		0.45 g/kWh
NO_x	(Oxides of Nitrogen as NO_2)	5.88 g/kWh
CO	(Carbon Monoxide)	1.05 g/kWh
PM	(Particular Matter)	0.08 g/kWh

EMISSION DATA

Cycle point	100% ESP		100% PRP		75% ESP		75% PRP		50% PRP	
Power [kW]	3007		2734		2255		2051		1367	
Speed [rpm]	1500		1500		1500		1500		1500	
NO_X [g/kWh]	9.3		7.8		6.0		5.9		5.2	
CO [g/kWh]	0.2		0.2		0.3		0.4		1.3	
HC [g/kWh]	0.29		0.31		0.34		0.35		0.45	
PM [g/kWh]	0.01		0.01		0.02		0.02		0.07	
	@ 5% O_2	@ 15% O_2	@ 5% O_2	@ 15% O_2	@ 5% O_2	@ 15% O_2	@ 5% O_2	@ 15% O_2	@ 5% O_2	@ 15% O_2
HC [mg/Nm³]	98	37	102	38	109	41	113	42	134	50
NOx [mg/Nm³]	3174	1190	2610	979	1920	720	1873	702	1538	577
CO [mg/Nm³]	79	30	82	31	105	39	120	45	382	143
PM [mg/Nm³]	2	1	2	1	7	3	6	2	21	8

APPENDIX 3
MODEL INPUTS AND RESULTS PROCESSING TOOLS

Table C.1: ADMS 6 Model inputs and data processing

Meteorological Data	2018 - 2022 Hourly meteorological data from London Heathrow has been used in the model. The wind rose is shown overleaf.
ADMS	ADMS 6, version 6.0.0.1
Latitude	52º
Surface Roughness	A value of 1.5 for Large Urban Areas was used for the modelled area and 0.5 for agricultural areas was used for the meteorological station site.
Minimum Monin-Obukhov length	A value of 100 for Large Conurbations was used to represent the modelled area and 30 for Cities and Large towns was used for the meteorological station site
NO_x to NO_2 Conversion	0.7 for annual mean 0.35 for hourly mean
Background Maps	2018 reference year background maps

Buildings

Table C.2: ADMS 6 buildings set up*

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
LHR21	520839	182997	39.7	27.2	116.6	167.6
SweetLand	520827	183050	9.0	117.6	35.8	77.7
WillesdenSubStn1	520929	183144	21.0	110.0	44.6	110.8
WillesdenSubStn2	520840	183120	9.0	14.7	81.2	201.0
WillesdenSubStn3	520982	183188	15.0	25.9	127.0	200.4
WillesdenSubStn4	520988	183225	11.0	16.1	77.6	201.6
Adwater1	520729	183025	9.0	49.1	16.2	134.7
Adwater2	520733	183039	9.0	7.6	35.4	45.0
Adwater3	520732	183052	9.0	25.1	9.0	135.4
Adwater4	520707	182991	12.0	74.7	61.7	135.1
Powergate1	520956	182886	11.0	48.4	118.4	78.1
Powergate2	521072	182845	17.0	85.5	157.5	167.1
Powergate3	520857	182821	12.0	62.0	107.3	134.7

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
Powergate4	520919	182828	12.0	18.1	46.7	77.6

* Building layout shown in Figure 4-1.

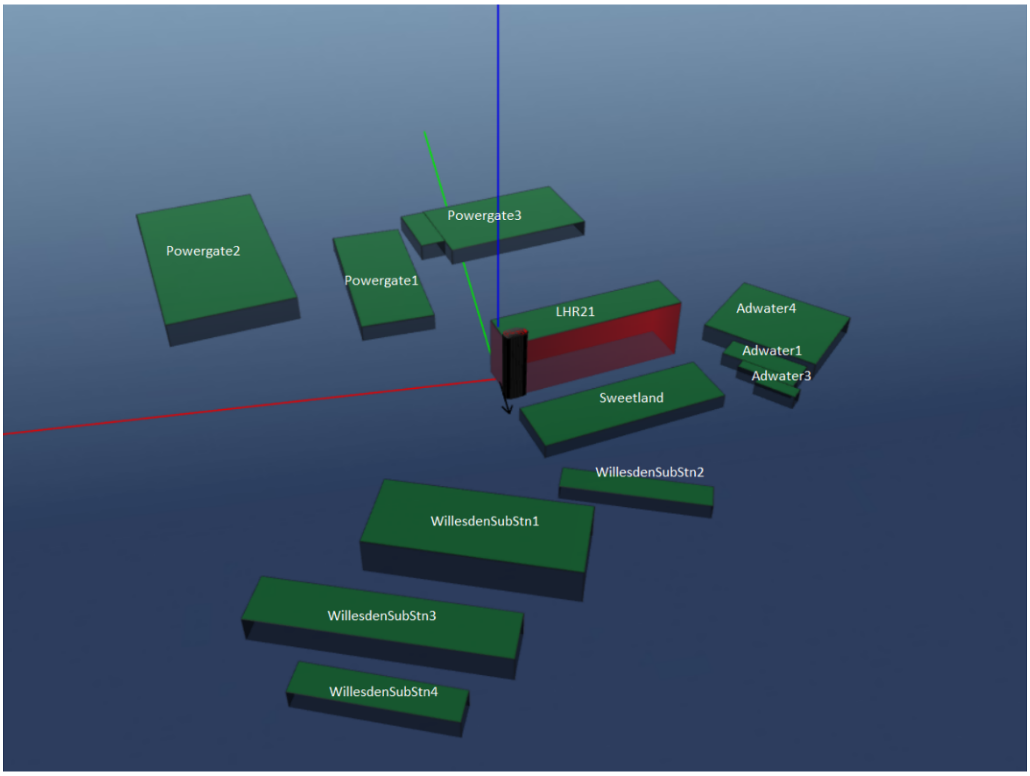
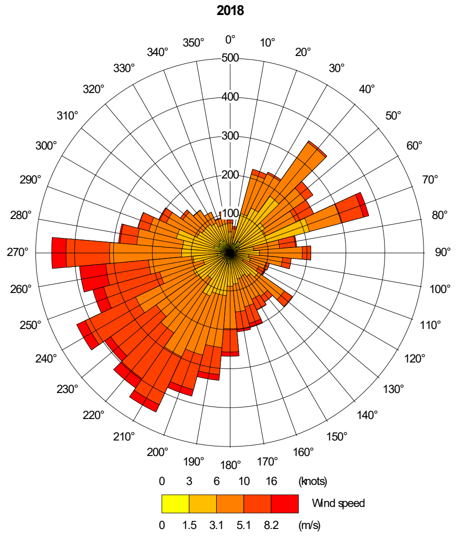


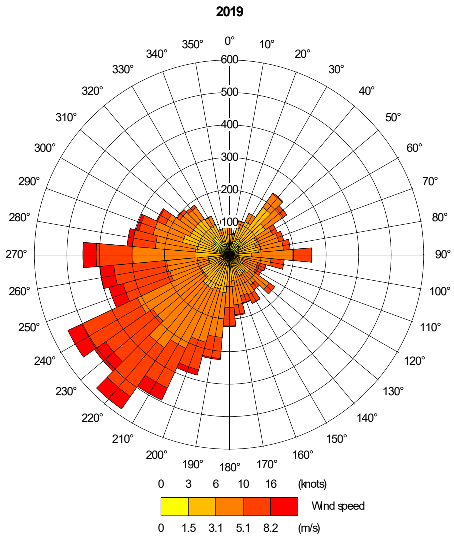
Figure C.1: ADMS Building Configuration

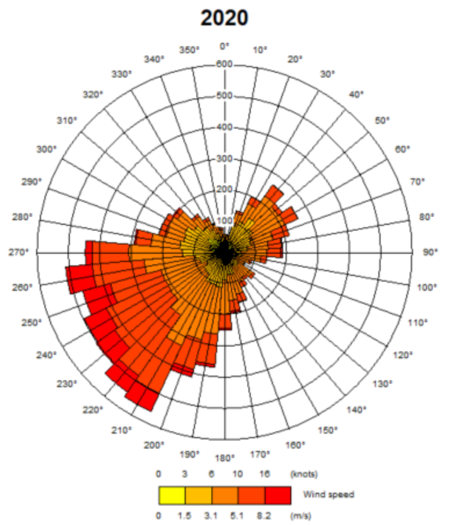
Name	X (m)	Y (m)
LHR21_1	520882.983556	183019.007839
LHR21_2	520884.003583	183019.236075
LHR21_3	520885.022408	183019.448515
LHR21_4	520886.041781	183019.668807
LHR21_5	520887.054428	183019.905749
LHR21_6	520888.073254	183020.118189
LHR21_7	520889.092626	183020.338481
LHR21_8	520890.104718	183020.567472
LHR21_9	520890.390849	183019.278335
LHR21_10	520889.380067	183019.065233
LHR21_11	520888.344152	183018.838306
LHR21_12	520887.331406	183018.601372
LHR21_13	520886.3549	183018.385199999
LHR21_14	520885.3399	183018.1414

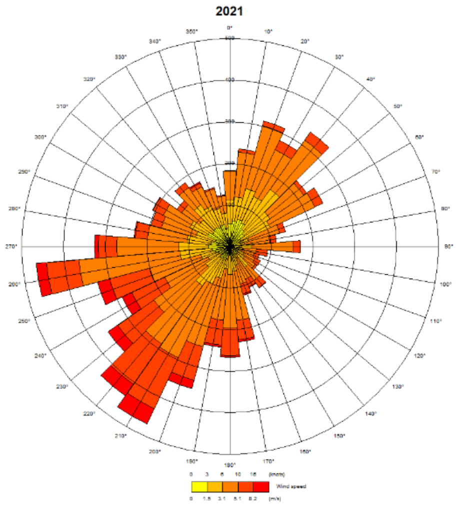
Figure C.2: ADMS Stack Locations

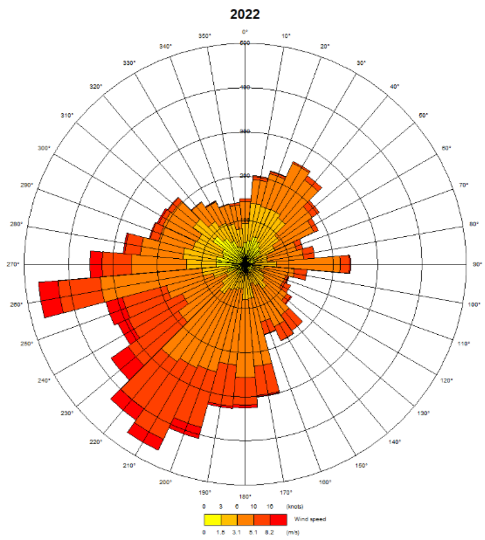
Heathrow Wind roses











APPENDIX 4
BACKGROUND CONCENTRATIONS

Background concentrations for the Site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[16].

In order to more accurately reflect background concentrations across the study area, Defra mapped background concentrations have been compared against concentrations measured at North Kensington Automatic Urban and Rural Network (AURN)[17] automatic urban background station in 2019 to produce a calibration factor and LBE diffusion tube EA03, which then has been applied to background concentrations across the study area (Table D.1). The AURN site has also been used in previous years by the LBHF to determine the local bias adjustment factor from a co-location diffusion tube studies[18].

Table D.1: 2019 DEFRA NO_2 Background Mapping adjustment factors (μg/m^3)

Source	Grid Reference (x,y)	Distance to Site (km)	Defra Modelled Background (μg/m^3)	Measured Concentration (μg/m^3)	Factor
KC1 North Kensington AURN	524045, 181752	2.8	33.8	27.3	0.808
EA03	514740, 180643	6.6	25.5	20.5	0.803
Average Factor					**0.806**

16 Department of the Environment, Food and Rural Affairs (Defra) (2019). '2017 Based Background Maps for NO_x, NO_2, PM_{10} and $PM_{2.5}$'

17 https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00253

18 Hammersmith & Fulham (2019). Hammersmith & Fulham Air Quality Annual Status Report for 2019. Date of publication: December 2019.

APPENDIX 5
HYPERGEOMETRIC DISTRIBUTION FUNCTION

Specified generators: air dispersion modelling example short term statistical analysis

The following text is taken from Environment Agency guidance as an illustration of the short term statistical analysis calculation:

The applicant applies for an environmental permit to operate:

- *an aggregated diesel specified generator site with a capacity of 40 MWth*
- *any time of the year for up to a maximum of 400 hours per year*

Operations are expected to last up to 4 hours when needed.

Therefore, the operating envelope is all 8760 hours in the year. There are 400 operational hours within the operating envelope.

Dispersion modelling over the full year shows that the Predicted Environmental Concentration (PEC) exceeds the hourly mean limit value of 200mg/m³ for 300 hours at a sensitive receptor over the worst modelled meteorological year.

This gives:

- *400 operational hours - the sample size denoted by 'N'*
- *an 8760 hour operating envelope - the population size denoted by 'M'*
- *300 exceedance hours - or the number of failures in the population denoted by 'e'*
- *8460 non-exceedance hours - the number of successes in the population denoted by 'K', where K = M - e = 8760 - 300 = 8460*

The probability of randomly selecting 19 or more exceedance hours (failures) in 400 sample trials, is the same as selecting at most 'N' minus 19 non-exceedance hours (successes) in 400 sample trials (N - 19 = 400 - 19 = 381). So you can calculate the probability of an exceedance, 'P' by using the cumulative hypergeometric distribution.

$$P = \sum_{i=0}^{N-19} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}}$$

Based on these data the cumulative hypergeometric distribution is 9.3%. As the continuous operations can be up to 4 hours, you multiply this probability by 2.5, giving a probability of exceedance of 23.25%. This indicates there is potential for an exceedance of the hourly standard.

The cumulative hypergeometric distribution calculates the probability to be less than 1.8% when there are 330 operational hours. Again multiplying this by the 2.5 factor gives a probability of 4.6%, indicating short term exceedances are unlikely.

Therefore we would propose to permit the generator and restrict the operational hours to 330 hours per year.

APPENDIX 6
RECEPTOR RESULTS

Emergency Scenario Results

The results of the dispersion modelling at existing are shown in Table F.1. The results are the highest from the five years' worth of modelling.

100th Percentile NO_2 Results

Table F.1: Predicted 100th percentile NO_2 Concentrations for Emergency Operation ($\mu g/m^3$)

Receptor	Height (m)	100th Percentile NO_2 PC ($\mu g/m^3$)	Background NO_2	PEC NO_2 ($\mu g/m^3$)	AEGL	DAQI
R1	1.5	98.0	50.2	148.2	<AEGL-1	3
R2	1.5	123.6	50.2	173.8	<AEGL-1	3
R3	1.5	135.2	50.2	185.4	<AEGL-1	3
H1	1.5	23.1	50.2	73.3	<AEGL-1	2
S1	1.5	35.7	50.2	85.9	<AEGL-1	2
RL1_GF	1.5	289.9	50.2	340.1	<AEGL-1	6
RL1_TF	9	289.9	50.2	340.1	<AEGL-1	6
RL2_GF	1.5	289.9	50.2	340.1	<AEGL-1	6
RL2_TF	9	289.9	50.2	340.1	<AEGL-1	6
RL3_GF	1.5	224.7	50.2	274.9	<AEGL-1	5
RL3_TF	9	224.7	50.2	274.9	<AEGL-1	5
C1	1.5	289.9	50.2	340.1	<AEGL-1	6
C2	1.5	289.9	50.2	340.1	<AEGL-1	6
AL1_GF	1.5	289.9	50.2	340.1	<AEGL-1	6
AL1_TF	9	289.9	50.2	340.1	<AEGL-1	6
AL2_GF	1.5	289.9	50.2	340.1	<AEGL-1	6
AL2_TF	9	289.9	50.2	340.1	<AEGL-1	6
AL3_GF	1.5	224.7	50.2	274.9	<AEGL-1	5
AL3_TF	9	224.7	50.2	274.9	<AEGL-1	5
AL4_GF	1.5	206.7	50.2	256.9	<AEGL-1	4
AL4_TF	21	205.2	50.2	255.4	<AEGL-1	4
AL5_GF	1.5	224.7	50.2	274.9	<AEGL-1	5
AL5_TF	12	224.7	50.2	274.9	<AEGL-1	5
GJ_1	1.5	250.6	50.2	300.8	<AEGL-1	5
GJ_2	4.5	243.9	50.2	294.1	<AEGL-1	5
NA1_GF	1.5	271.2	50.2	321.4	<AEGL-1	5
NA1_TF	9	271.2	50.2	321.4	<AEGL-1	5
NA2_GF	1.5	208.6	50.2	258.8	<AEGL-1	4

Table F.1: Predicted 100th percentile NO_2 Concentrations for Emergency Operation ($\mu g/m^3$)

Receptor	Height (m)	100th Percentile NO_2 PC ($\mu g/m^3$)	Background NO_2	PEC NO_2 ($\mu g/m^3$)	AEGL	DAQI
NA2_TF	9	208.6	50.2	258.8	<AEGL-1	4
NA3_GF	1.5	175.5	50.2	225.7	<AEGL-1	4
NA3_TF	9	175.5	50.2	225.7	<AEGL-1	4
NA4_GF	1.5	83.2	50.2	133.4	<AEGL-1	2
NA4_TF	12	84.7	50.2	134.9	<AEGL-1	3
RG1	1.5	212.5	50.2	262.7	<AEGL-1	4
RG2	1.5	299.2	50.2	349.4	<AEGL-1	6
RG3	1.5	276.9	50.2	327.1	<AEGL-1	5
RG4	1.5	299.2	50.2	349.4	<AEGL-1	6
RG5	1.5	299.2	50.2	349.4	<AEGL-1	6
PB1_GF	1.5	168.7	50.2	218.9	<AEGL-1	4
PB1_TF	12	136.8	50.2	187.0	<AEGL-1	3
PB2_GF	1.5	299.2	50.2	349.4	<AEGL-1	6
PB2_TF	12	299.2	50.2	349.4	<AEGL-1	6
PB3_GF	1.5	282.3	50.2	332.5	<AEGL-1	5
PB3_TF	12	241.0	50.2	291.2	<AEGL-1	5
PB4_GF	1.5	299.2	50.2	349.4	<AEGL-1	6
PB4_TF	11	299.2	50.2	349.4	<AEGL-1	6
PB5_GF	1.5	84.7	50.2	134.9	<AEGL-1	3
PB5_TF	17	86.5	50.2	136.7	<AEGL-1	3

Particulate Matter

Table F.2: Predicted Daily Mean PM_{10} Concentrations ($\mu g/m^3$)

Receptor	Height (m)	Daily Mean PM_{10} PC ($\mu g/m^3$)	% Change in concentration relative to AQO	Background PM_{10} ($\mu g/m^3$)	PEC PM_{10} ($\mu g/m^3$)	PEC as % of Objective
R1	1.5	0.73	1.5	33.3	34.0	68.1
R2	1.5	0.92	1.8	33.3	34.2	68.4
R3	1.5	0.88	1.8	33.3	34.2	68.4
H1	1.5	0.11	0.2	33.3	33.4	66.8
S1	1.5	0.32	0.6	35.8	36.1	72.2
RL1_GF	1.5	1.30	2.6	33.8	35.1	70.1
RL1_TF	9	1.30	2.6	33.8	35.1	70.1
RL2_GF	1.5	2.09	4.2	33.8	35.9	71.7

Table F.2: Predicted Daily Mean PM_{10} Concentrations (µg/m³)						
Receptor	**Height (m)**	**Daily Mean PM_{10} PC (µg/m³)**	**% Change in concentration relative to AQO**	**Background PM_{10} (µg/m³)**	**PEC PM_{10} (µg/m³)**	**PEC as % of Objective**
RL2_TF	9	2.09	4.2	33.8	35.9	71.7
RL3_GF	1.5	1.28	2.6	33.8	35.0	70.1
RL3_TF	9	1.28	2.6	33.8	35.0	70.1
C1	1.5	1.19	2.4	33.8	35.0	69.9
C2	1.5	1.13	2.3	33.8	34.9	69.8
AL1_GF	1.5	1.45	2.9	33.8	35.2	70.5
AL1_TF	9	1.47	2.9	33.8	35.2	70.5
AL2_GF	1.5	1.56	3.1	33.8	35.3	70.7
AL2_TF	9	1.57	3.1	33.8	35.3	70.7
AL3_GF	1.5	1.31	2.6	33.8	35.1	70.2
AL3_TF	9	1.31	2.6	33.8	35.1	70.2
AL4_GF	1.5	1.18	2.4	33.8	35.0	69.9
AL4_TF	21	1.00	2.0	33.8	34.8	69.5
AL5_GF	1.5	0.87	1.7	33.8	34.6	69.3
AL5_TF	12	0.84	1.7	33.8	34.6	69.2
GJ_1	1.5	0.79	1.6	33.8	34.6	69.1
GJ_2	4.5	0.76	1.5	33.8	34.5	69.1
NA1_GF	1.5	0.76	1.5	33.8	34.5	69.1
NA1_TF	9	0.76	1.5	33.8	34.5	69.1
NA2_GF	1.5	0.57	1.1	33.8	34.3	68.7
NA2_TF	9	0.60	1.2	33.8	34.4	68.7
NA3_GF	1.5	0.46	0.9	33.8	34.2	68.5
NA3_TF	9	0.46	0.9	33.8	34.2	68.5
NA4_GF	1.5	0.31	0.6	33.3	33.6	67.2
NA4_TF	12	0.33	0.7	33.3	33.6	67.3
RG1	1.5	1.39	2.8	33.3	34.7	69.4
RG2	1.5	2.32	4.6	33.3	35.6	71.3
RG3	1.5	1.16	2.3	33.3	34.5	68.9
RG4	1.5	2.33	4.7	33.3	35.6	71.3
RG5	1.5	2.04	4.1	33.3	35.3	70.7
PB1_GF	1.5	1.02	2.0	33.3	34.3	68.6
PB1_TF	12	0.96	1.9	33.3	34.3	68.5
PB2_GF	1.5	1.43	2.9	33.3	34.7	69.5
PB2_TF	12	1.46	2.9	33.3	34.8	69.5
PB3_GF	1.5	1.02	2.0	33.3	34.3	68.7
PB3_TF	12	0.96	1.9	33.3	34.3	68.5
PB4_GF	1.5	1.21	2.4	33.3	34.5	69.0
PB4_TF	11	1.22	2.4	33.3	34.5	69.0

Table F.2: Predicted Daily Mean PM_{10} Concentrations (µg/m³)						
Receptor	**Height (m)**	**Daily Mean PM_{10} PC (µg/m³)**	**% Change in concentration relative to AQO**	**Background PM_{10} (µg/m³)**	**PEC PM_{10} (µg/m³)**	**PEC as % of Objective**
PB5_GF	1.5	0.35	0.7	33.0	33.3	66.7
PB5_TF	17	0.41	0.8	33.0	33.4	66.8
PC: process contribution PEC: annual mean predicted environmental concentration (i.e. including background) GF: Ground Floor TF: Top Floor						

Table F.3: Predicted Annual Mean PM_{10} Concentrations (µg/m³)						
Receptor	**Height (m)**	**Annual Mean PM_{10} PC (µg/m³)***	**% Change in concentration relative to AQO**	**Background PM_{10} (µg/m³)**	**PEC PM_{10} (µg/m³)**	**PEC as % of Objective**
R1	1.5	0.001	0.004	16.7	16.7	41.6
R2	1.5	0.002	0.005	16.7	16.7	41.6
R3	1.5	0.002	0.005	16.7	16.7	41.6
H1	1.5	0.000	0.001	16.7	16.7	41.6
S1	1.5	0.001	0.002	17.9	17.9	44.7
RL1_GF	1.5	0.003	0.008	16.9	16.9	42.2
RL1_TF	9	0.003	0.008	16.9	16.9	42.2
RL2_GF	1.5	0.006	0.016	16.9	16.9	42.2
RL2_TF	9	0.006	0.016	16.9	16.9	42.2
RL3_GF	1.5	0.004	0.009	16.9	16.9	42.2
RL3_TF	9	0.004	0.009	16.9	16.9	42.2
C1	1.5	0.003	0.007	16.9	16.9	42.2
C2	1.5	0.003	0.006	16.9	16.9	42.2
AL1_GF	1.5	0.004	0.009	16.9	16.9	42.2
AL1_TF	9	0.004	0.009	16.9	16.9	42.2
AL2_GF	1.5	0.004	0.011	16.9	16.9	42.2
AL2_TF	9	0.004	0.011	16.9	16.9	42.2
AL3_GF	1.5	0.004	0.009	16.9	16.9	42.2
AL3_TF	9	0.004	0.009	16.9	16.9	42.2
AL4_GF	1.5	0.003	0.008	16.9	16.9	42.2
AL4_TF	21	0.003	0.006	16.9	16.9	42.2
AL5_GF	1.5	0.002	0.006	16.9	16.9	42.2
AL5_TF	12	0.002	0.006	16.9	16.9	42.2
GJ_1	1.5	0.002	0.005	16.9	16.9	42.2
GJ_2	4.5	0.002	0.005	16.9	16.9	42.2
NA1_GF	1.5	0.002	0.004	16.9	16.9	42.2

Table F.3: Predicted Annual Mean PM_{10} Concentrations (µg/m³)

Receptor	Height (m)	Annual Mean PM_{10} PC (µg/m³)*	% Change in concentration relative to AQO	Background PM_{10} (µg/m³)	PEC PM_{10} (µg/m³)	PEC as % of Objective
NA1_TF	9	0.002	0.004	16.9	16.9	42.2
NA2_GF	1.5	0.001	0.003	16.9	16.9	42.2
NA2_TF	9	0.001	0.003	16.9	16.9	42.2
NA3_GF	1.5	0.001	0.003	16.9	16.9	42.2
NA3_TF	9	0.001	0.003	16.9	16.9	42.2
NA4_GF	1.5	0.001	0.001	16.7	16.7	41.6
NA4_TF	12	0.001	0.002	16.7	16.7	41.6
RG1	1.5	0.003	0.008	16.7	16.7	41.6
RG2	1.5	0.007	0.017	16.7	16.7	41.7
RG3	1.5	0.002	0.005	16.7	16.7	41.6
RG4	1.5	0.005	0.013	16.7	16.7	41.6
RG5	1.5	0.004	0.011	16.7	16.7	41.6
PB1_GF	1.5	0.002	0.005	16.7	16.7	41.6
PB1_TF	12	0.002	0.005	16.7	16.7	41.6
PB2_GF	1.5	0.003	0.007	16.7	16.7	41.6
PB2_TF	12	0.003	0.007	16.7	16.7	41.6
PB3_GF	1.5	0.002	0.006	16.7	16.7	41.6
PB3_TF	12	0.002	0.005	16.7	16.7	41.6
PB4_GF	1.5	0.002	0.006	16.7	16.7	41.6
PB4_TF	11	0.002	0.006	16.7	16.7	41.6
PB5_GF	1.5	0.001	0.002	16.5	16.5	41.2
PB5_TF	17	0.001	0.002	16.5	16.5	41.2

*Running at 72 hours
PC: process contribution
PEC: annual mean predicted environmental concentration (i.e. including background)
GF: Ground Floor
TF: Top Floor

Table F.4: Predicted Annual Mean $PM_{2.5}$ Concentrations (µg/m³)

Receptor	Height (m)	Annual Mean $PM_{2.5}$ PC (µg/m³)*	% Change in concentration relative to AQO	Background $PM_{2.5}$ (µg/m³)	PEC $PM_{2.5}$ (µg/m³)	PEC as % of Objective
R1	1.5	0.001	0.007	11.0	11.0	55.1
R2	1.5	0.002	0.010	11.0	11.0	55.1
R3	1.5	0.002	0.009	11.0	11.0	55.1
H1	1.5	0.000	0.001	11.0	11.0	55.1
S1	1.5	0.001	0.005	11.7	11.7	58.4

Table F.4: Predicted Annual Mean $PM_{2.5}$ Concentrations (µg/m³)

Receptor	Height (m)	Annual Mean $PM_{2.5}$ PC (µg/m³)*	% Change in concentration relative to AQO	Background $PM_{2.5}$ (µg/m³)	PEC $PM_{2.5}$ (µg/m³)	PEC as % of Objective
RL1_GF	1.5	0.003	0.015	11.2	11.2	56.0
RL1_TF	9	0.003	0.015	11.2	11.2	56.0
RL2_GF	1.5	0.006	0.032	11.2	11.2	56.0
RL2_TF	9	0.006	0.032	11.2	11.2	56.0
RL3_GF	1.5	0.004	0.018	11.2	11.2	56.0
RL3_TF	9	0.004	0.018	11.2	11.2	56.0
C1	1.5	0.003	0.014	11.2	11.2	56.0
C2	1.5	0.003	0.013	11.2	11.2	56.0
AL1_GF	1.5	0.004	0.019	11.2	11.2	56.0
AL1_TF	9	0.004	0.019	11.2	11.2	56.0
AL2_GF	1.5	0.004	0.021	11.2	11.2	56.0
AL2_TF	9	0.004	0.021	11.2	11.2	56.0
AL3_GF	1.5	0.004	0.019	11.2	11.2	56.0
AL3_TF	9	0.004	0.019	11.2	11.2	56.0
AL4_GF	1.5	0.003	0.017	11.2	11.2	56.0
AL4_TF	21	0.003	0.013	11.2	11.2	56.0
AL5_GF	1.5	0.002	0.012	11.2	11.2	56.0
AL5_TF	12	0.002	0.012	11.2	11.2	56.0
GJ_1	1.5	0.002	0.010	11.2	11.2	56.0
GJ_2	4.5	0.002	0.009	11.2	11.2	56.0
NA1_GF	1.5	0.002	0.008	11.2	11.2	56.0
NA1_TF	9	0.002	0.008	11.2	11.2	56.0
NA2_GF	1.5	0.001	0.007	11.2	11.2	56.0
NA2_TF	9	0.001	0.007	11.2	11.2	56.0
NA3_GF	1.5	0.001	0.005	11.2	11.2	55.9
NA3_TF	9	0.001	0.005	11.2	11.2	55.9
NA4_GF	1.5	0.001	0.003	11.0	11.0	55.1
NA4_TF	12	0.001	0.003	11.0	11.0	55.1
RG1	1.5	0.003	0.015	11.0	11.0	55.1
RG2	1.5	0.007	0.035	11.0	11.0	55.2
RG3	1.5	0.002	0.010	11.0	11.0	55.1
RG4	1.5	0.005	0.027	11.0	11.0	55.2
RG5	1.5	0.004	0.022	11.0	11.0	55.1
PB1_GF	1.5	0.002	0.010	11.0	11.0	55.1
PB1_TF	12	0.002	0.010	11.0	11.0	55.1
PB2_GF	1.5	0.003	0.013	11.0	11.0	55.1
PB2_TF	12	0.003	0.014	11.0	11.0	55.1
PB3_GF	1.5	0.002	0.011	11.0	11.0	55.1

Table F.4: Predicted Annual Mean $PM_{2.5}$ Concentrations (µg/m³)						
Receptor	**Height (m)**	**Annual Mean $PM_{2.5}$ PC (µg/m³)***	**% Change in concentration relative to AQO**	**Background $PM_{2.5}$ (µg/m³)**	**PEC $PM_{2.5}$ (µg/m³)**	**PEC as % of Objective**
PB3_TF	12	0.002	0.010	11.0	11.0	55.1
PB4_GF	1.5	0.002	0.011	11.0	11.0	55.1
PB4_TF	11	0.002	0.011	11.0	11.0	55.1
PB5_GF	1.5	0.001	0.004	10.9	10.9	54.4
PB5_TF	17	0.001	0.004	10.9	10.9	54.4

*Running at 72 hours
PC: process contribution
PEC: annual mean predicted environmental concentration (i.e. including background)
GF: Ground Floor
TF: Top Floor

Ecological Results

Table F.5 Predicted Daily mean 100th percentile NO_x Concentrations for Emergency Operation (µg/m³)

ID	NOx 24 hour 100th Percentile (PC) (µg/m3)	AQO	PC as % as Ob
RPSAC	1.1	75	1.5%
WCSAC	1.5	75	2.1%
WSLNR	18.2	75	24.3%
AbRdMount	10.3	75	13.7%
ActonPark	4.4	75	5.9%
ActonRail_01	25.0	75	33.3%
ActonRail_02	21.3	75	28.4%
ActonRail_03	23.3	75	31.1%
ActonRail_04	16.5	75	22.0%
BrentCanFeeder	52.5	75	70.1%
BrentOpenSpace	10.2	75	13.6%
CanalFeeder	27.9	75	37.2%
Central_WWhiteC	11.8	75	15.8%
CentralWest_01	17.7	75	23.5%
CentralWest_02	18.6	75	24.8%
CentralWestRuis	4.2	75	5.6%
Connell_Cres	7.4	75	9.8%
DHL_02	74.3	75	99.0%
DHL_03	59.9	75	79.9%
DiageoLake_North	13.2	75	17.6%
DiageoLake_South	15.6	75	20.8%
Elmwood	9.2	75	12.3%
GUC_EAST_DHL_01	82.7	75	110.3%

GUC_North	345.5	75	460.6%
GUC_Tow	21.4	75	28.6%
GUC_West	62.8	75	83.7%
GuinnessMound	14.2	75	19.0%
Harl_Wem_Brook	7.7	75	10.2%
HarlWebCen	64.7	75	86.2%
KensalGrnCem	6.9	75	9.2%
LilWormScrubs	6.6	75	8.8%
LonCanal	23.3	75	31.0%
MasonGreenLn	10.4	75	13.8%
NorthActon	12.4	75	16.5%
NorthActonCem	25.9	75	34.6%
OldOak_Slidings	27.9	75	37.1%
OldOak_Slidings_02	25.6	75	34.2%
Picc_Dist_Ealing	14.7	75	19.7%
RailSideHab_01	17.2	75	22.9%
RailSideHab_02	16.0	75	21.3%
RiverBrentHang	4.6	75	6.1%
RiverBrentWest	4.7	75	6.3%
RndWdPk_WilsCem	9.8	75	13.1%
SilMet	21.0	75	28.0%
StMaryChurchYrd	7.7	75	10.3%
StMarysCem	8.1	75	10.7%
StMarysRC_Cem	7.6	75	10.1%
TheOldOrch	9.5	75	12.6%
Trinity_Way	8.3	75	11.1%
Twyford_AbGround	8.8	75	11.8%
WemBrook	8.8	75	11.7%
WesleyPlaying	445.2	75	593.6%
WhiteCityGar	6.7	75	8.9%

Testing Scenario Results

100th Percentile NO_2 Results

Table F.6 Predicted 100th percentile NO_2 Concentrations for Emergency Operation (μg/m³)

Receptor	Height (m)	100th Percentile NO_2 pc (μg/m³)	Background NO_2	PEC NO_2 (μg/m³)	AEGL	DAQI
R1	1.5	20.8	50.2	71.0	<AEGL-1	2
R2	1.5	26.2	50.2	76.4	<AEGL-1	2
R3	1.5	29.5	50.2	79.7	<AEGL-1	2
H1	1.5	4.7	50.2	54.9	<AEGL-1	1

Table F.6 Predicted 100th percentile NO_2 Concentrations for Emergency Operation (μg/m³)						
Receptor	**Height (m)**	**100th Percentile NO_2 pc (μg/m³)**	**Background NO_2**	**PEC NO_2 (μg/m³)**	**AEGL**	**DAQI**
S1	1.5	7.5	50.2	57.7	<AEGL-1	1
RL1_GF	1.5	68.3	50.2	118.5	<AEGL-1	2
RL1_TF	9	68.3	50.2	118.5	<AEGL-1	2
RL2_GF	1.5	68.3	50.2	118.5	<AEGL-1	2
RL2_TF	9	68.3	50.2	118.5	<AEGL-1	2
RL3_GF	1.5	45.9	50.2	96.1	<AEGL-1	2
RL3_TF	9	45.9	50.2	96.1	<AEGL-1	2
C1	1.5	68.3	50.2	118.5	<AEGL-1	2
C2	1.5	68.3	50.2	118.5	<AEGL-1	2
AL1_GF	1.5	68.3	50.2	118.5	<AEGL-1	2
AL1_TF	9	68.3	50.2	118.5	<AEGL-1	2
AL2_GF	1.5	68.3	50.2	118.5	<AEGL-1	2
AL2_TF	9	68.3	50.2	118.5	<AEGL-1	2
AL3_GF	1.5	45.9	50.2	96.1	<AEGL-1	2
AL3_TF	9	45.9	50.2	96.1	<AEGL-1	2
AL4_GF	1.5	42.2	50.2	92.4	<AEGL-1	2
AL4_TF	21	40.7	50.2	90.9	<AEGL-1	2
AL5_GF	1.5	45.9	50.2	96.1	<AEGL-1	2
AL5_TF	12	45.9	50.2	96.1	<AEGL-1	2
GJ_1	1.5	57.5	50.2	107.7	<AEGL-1	2
GJ_2	4.5	56.0	50.2	106.2	<AEGL-1	2
NA1_GF	1.5	68.3	50.2	118.5	<AEGL-1	2
NA1_TF	9	68.3	50.2	118.5	<AEGL-1	2
NA2_GF	1.5	51.3	50.2	101.5	<AEGL-1	2
NA2_TF	9	51.3	50.2	101.5	<AEGL-1	2
NA3_GF	1.5	41.0	50.2	91.2	<AEGL-1	2
NA3_TF	9	41.0	50.2	91.2	<AEGL-1	2
NA4_GF	1.5	16.9	50.2	67.1	<AEGL-1	1
NA4_TF	12	17.3	50.2	67.5	<AEGL-1	1
RG1	1.5	43.5	50.2	93.7	<AEGL-1	2
RG2	1.5	70.1	50.2	120.3	<AEGL-1	2
RG3	1.5	62.2	50.2	112.4	<AEGL-1	2
RG4	1.5	70.1	50.2	120.3	<AEGL-1	2

Table F.6 Predicted 100th percentile NO_2 Concentrations for Emergency Operation (µg/m^3)						
Receptor	**Height (m)**	**100th Percentile NO_2 pc (µg/m^3)**	**Background NO_2**	**PEC NO_2 (µg/m^3)**	**AEGL**	**DAQI**
RG5	1.5	70.1	50.2	120.3	<AEGL-1	2
PB1_GF	1.5	35.8	50.2	86.0	<AEGL-1	2
PB1_TF	12	29.0	50.2	79.2	<AEGL-1	2
PB2_GF	1.5	70.1	50.2	120.3	<AEGL-1	2
PB2_TF	12	70.1	50.2	120.3	<AEGL-1	2
PB3_GF	1.5	66.3	50.2	116.5	<AEGL-1	2
PB3_TF	12	56.6	50.2	106.8	<AEGL-1	2
PB4_GF	1.5	70.1	50.2	120.3	<AEGL-1	2
PB4_TF	11	70.1	50.2	120.3	<AEGL-1	2
PB5_GF	1.5	17.7	50.2	67.9	<AEGL-1	2
PB5_TF	17	17.9	50.2	68.1	<AEGL-1	2